Does Cooperation Enhance Competitiveness?

Assessing the Impacts of Collaborative Business Relationships

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Abstract

Collaboration among firms is now a ubiquitous phenomenon. Many theoretical and managerial perspectives argue that firms that collaborate will outperform those firms that take independent approaches. This thesis reports the results of a study of New Zealand firms that examines the relationship between firm performance and participation in collaborative relationships. Environmental conditions and a firm's strategic orientation are also considered. Given the prevalence of cooperation, the thesis also investigates why many firms do not collaborate. The results of the moderated regression analysis indicate that there are no performance differences, across any of the performance measures used in the study, between firms involved in collaborative activity and firms that choose to remain independent. There is, however, some evidence suggesting that collaborating firms have higher performance levels than firms that would like to collaborate, but are unable to do so. The results also suggest that a firm's strategic orientation influences performance; customer- and technological-orientation both exhibit a positive association with firm performance. The thesis critically evaluates and tests the widely stated but little-tested argument that interfirm collaboration is usually beneficial.

Introduction

Collaborative relationships among firms are now a pervasive feature of the business landscape. Collaborative business relationships cover a diversity of arrangements including vertical supplier-buyer relations, technology exchanges, joint product development, and collaborative marketing arrangements. Their proliferation has lead to increased research into some of the causes and consequences of such relationships (Gulati 1998; Varadarajan and Cunningham 1995). A large body of literature has identified many potential benefits of interfirm collaboration. Collaboration between firms has been suggested for a myriad of purposes including, gaining access to markets, channels, and knowledge; realising economies of scale; accelerating market entry; and enhancing firm capabilities (Hagedoorn 1993; Varadarajan and Cunningham 1995). Their use is not restricted to large firms, with an increasing number of small firms using collaboration to compensate for a lack of resources and capabilities (Forrest 1990; McGee, Dowling, and Megginson 1995). Indeed, it has been argued that "one of the most rapidly emerging theories about the competitiveness of small- and medium-sized enterprises is that both can be enhanced through interfirm collaboration" (Rosenfeld 1996, p.247). While the literature outlining the motivations for and potential benefits of collaborative activity has continued to expand, the performance consequences of collaborative relationships has been left largely unexplored (Singh 1997). Thus, although we now have a good grasp of the potential outcomes of collaborating, the relative efficacy of collaboration in achieving these outcomes has yet to be properly examined.

The performance consequences of collaborative business relationships is an important issue, both in terms of the performance of the relationship itself and the performance of firms entering cooperative arrangements. Gulati (1998) discusses two research questions that examine the performance issue: (1) What factors influence the success of collaborative relationships? and (2) What is the effect of collaborative relationships on the performance of firms entering them? In recent years, the former question has received considerable researcher attention, however, the latter question has not been adequately addressed (Gulati 1998; Mitchell and Singh 1996; Smith, Carroll, and Ashford 1995). Indeed, empirical research has predominately focused on firms that ally, implicitly assuming that collaboration was the right thing to do, yet this literature has never stopped to question

whether cooperation was the best option in the first place.

Do firms benefit from entering collaborative business relationships? The popular argument in the alliance literature is that cooperation allows collaborating firms to achieve better performance. Indeed, "the large strategy literature concerning this subject sometimes offers interfirm collaboration as a panacea by which businesses can address and overcome a wide range of limitations" (Mitchell and Singh 1996, p.191). However, very little empirical research exists to verify this generalised argument (Singh 1997; Smith et al. 1995). The small body of empirical research that has investigated the link between collaboration and performance provides mixed results for such an assertion (e.g., Combs and Ketchen 1999; Dollinger and Golden 1992; McGee et al. 1995; Mitchell and Singh 1996). Moreover, the empirical literature that does exist gives no clear indication as to the benefits or costs that can be attributable to such interfirm collaborative activities. Since many other activities besides the collaborative activity of firms can also influence the performance of firms, it can be difficult to empirically link the cooperative activity of firms with their performance. Given the current lack of evidence regarding both the relative benefits and costs of collaborating, it seems timely to remember that firms *collaborate* in pursuit of *competitive* advantage (Gordon 1998; Jarillo 1988). The true test of the value of collaboration can only be evaluated by comparing the competitive position of firms involved in collaborative relationships with those firms taking an independent approach.

The purpose of this thesis is to address three broad questions concerning firms and their use of collaborative business relationships.[1] The first, and primary, question of this thesis concerns the efficacy of collaborative business relationships in achieving various performance outcomes compared with firms that compete independently. Do collaborating firms have higher performance levels than firms that remain independent? Do certain conditions, internal or external to the firm, make collaboration a more effective strategy than remaining independent? The literature on collaboration suggests that collaboration

[1] Collaborative business relationships are broadly defined as those interfirm relationships: having strategic goals which are defined by all parties in the relationship, which are long-term in nature as opposed to one-off agreements, involving mutual effort and shared control. This thesis focuses on *Contractual Collaborations*, defined as non-equity formal agreements between two or more legally separable organisations, including technical buybacks, licenses, strategic alliances, and management and service agreements (Gordon 1999).

may be more beneficial in some environmental contexts than in others (Dollinger and Golden 1992; Grant and Baden-Fuller 1995).

Second, can firms leverage their collaborative relationships in order to *improve* their firm's performance? Even if the answer to the first question is no, affirmation of this second question would still have important implications for firms: managers could improve their firm's current position by entering a collaborative relationship. While cooperation might not lead to participating firms outperforming others in their industry in absolute terms, it may lead to an improvement in their relative position.

Finally, I investigate why many firms still do not use collaboration. If collaborating firms are found to have a positive performance differential over firms taking independent approaches, why don't all firms collaborate? Constraints such as the inability to find appropriate partners may exist that inhibit managers from entering collaborative activities that would be beneficial to the firm (Varadarajan and Cunningham 1995). Firms that can't collaborate due to such constraints, as opposed to firms that choose not to collaborate, may well perform worse than both collaborating firms and firms that remain independent by choice.

My thesis tries to address these questions by reporting the results of a study of New Zealand firms that examines the relationship between participation in collaborative relationships and firm performance. Since environmental conditions and a firm's strategic orientation may also influence performance directly and in combination with collaborative activity, these variables are also considered. The thesis has four major sections: literature review, research methodology, results, and discussion and conclusions. The literature review begins by discussing the theoretical underpinnings for this thesis, goes on to examine the relevant extant empirical evidence, and is wrapped up with the presentation of the conceptual framework and specific hypotheses tested. The next section reviews the methodological procedure used to conduct this thesis. This is followed by the presentation of the results of my analysis. In the discussion section, I review my findings, point out the limitations of this thesis and direct attention to the implications for future research and practice.

Literature Review

In this section, I examine the potential outcomes associated with collaborative relationships - both positive and negative. Several theoretical perspectives that have been used to analyse the impact of cooperative behaviour on performance frame this discussion. Next, I examine the existing empirical research that has investigated the relationship between cooperation and various financial and non-financial outcomes. Finally, I compare the empirical evidence with the theoretical perspectives to determine the degree to which these theories explain the empirical findings.

The Benefits of Collaboration

This section provides an exposition of the potential benefits that may be derived through cooperative activity. Throughout, I frame the discussion using four theoretical approaches that are especially relevant in explaining the non-economic and performance outcomes of collaborative business activity: resource dependence theory, the resource-based view of the firm, transaction cost theory, and strategic behaviour theory. Collectively, these four theoretical frameworks advanced to explain the evolution of collaborative activity suggest that market uncertainty, the drive for increased efficiency, resource dependency, skill and resource heterogeneity, and imperfect factor markets lead firms to form relationships with other firms in their quest for competitive advantage.

Motives for Collaborating

A discussion of the beneficial outcomes associated with collaborative activity is best framed by discussing the motives to cooperate, since there are as many possible benefits to the formation of collaborative business relationships as there are motives for entering these types of agreements (Day 1995). Moreover, the existing literature on collaboration has predominately focused on explicating the motives rather than investigating the outcomes of cooperating.

From an economic perspective, the main argument for collaborative arrangements is that they are usually formed as a result of an external stimulus or change in environmental conditions, which reveals an internal resource inadequacy that needs to be corrected if competitive advantage is to be maintained (Child and Faulkner 1998). There exists a long

list of both external and internal conditions, any of which is sufficient to provide the base motivations for interfirm collaborative agreements. In the main, these motivations relate to the perceived resource or competency imbalances of firms in the face of external challenges, threats, opportunities, and competition. Interfirm collaborative agreements are thus an alternative to independent or market-based mechanisms for addressing these imbalances. While the literature on interorganisational relationships has developed a plethora of potential motives for collaborating, the collaborative advantages to be considered with respect to these various types of interfirm relationships boil down to what Contractor and Lorange (1988, p.9) identify as seven 'more or less overlapping objectives':

1. risk reduction;
2. achievement of economies of scale and/or rationalisation;
3. technology exchanges;
4. co-opting or blocking competition;
5. overcoming government-mandated trade or investment barriers;
6. facilitating initial international expansion of inexperienced firms;
7. vertical quasi-integration advantages of linking the complementary contributions of the partners in a 'value chain'.

In fact, these seven motives can be further reduced when viewed from the perspective of the internal needs of the firm. In the face of external forces, Pfeffer and Nowak (1976) and Porter and Fuller (1986) suggest several possible reasons for concluding cooperative arrangements which may be seen from the perspective of internal stimuli:

1. to achieve economies of scale and of learning with one's partner;
2. to get access to the benefits of the other firm's assets, be these technological, market access, capital, production capacity, products, or manpower;
3. to reduce risk by sharing it, notably in terms of capital requirements, but also often in respect of research and development expenditure;
4. to help shape the market-for example, to withdraw capacity in a mature market.

Resource Dependency

While companies are motivated to form alliances for a variety of specific reasons, most come under the purview of perceived resource deficiency. Alone, the potential of each partner's financial and other resources, core competencies and skills, and networks of contacts is inadequate to achieve its desired objectives. With collaboration, however, the potential synergies from working together are perceived as leading to competitive advantage, which is jointly, but not separately available (Child and Faulkner 1998).

Resource dependence theory argues that in order to survive, organisations must acquire resources (Pfeffer and Salanik 1978). Resource dependency assumes that firms are heterogeneous in respect to their abilities to acquire resources. It is also based on the premise that few, if any, organisations are self-sufficient with respect to all required resources (Song 1995). The organisation is therefore dependent on external organisations for resources: the firm must participate in exchanges in order to acquire resources needed to achieve goals and ensure survival (Pfeffer and Salancik 1978; Sriram, Krapfel, and Spekman 1992). Thus, resource dependence theory views the organisation's external environment as the primary source of scarce resources (Galaskiewicz 1985). This lack of self-sufficiency leads to dependence on other firms and introduces uncertainty into the firm's decision-making environment. The formation of collaborative relationships is one mechanism for reducing environmental uncertainty and enhancing resource access, while at the same time maintaining a reasonable level of organisational autonomy (Gales and Blackburn 1990; Gray and Yan 1992). However, collaboration is only one of several alternative courses of action a firm can use to deal with perceived resource deficiency. Other options available include raising further capital in the market, recruiting key personnel in areas where expertise is lacking, a merger or acquisition, or the development of market transactions to acquire necessary resources. Thus, while resource deficiency is one important reason for the formation of collaborative agreements, it does not explain why collaborating is a more beneficial mechanism for acquiring resources than these other alternative courses of action.

Resource Deficiency and Learning

A complementary perspective, the resource-based view of the firm, also builds on the assumption that strategic resources are heterogeneously distributed across firms. This

perspective examines the link between firm resources and sustained competitive advantage (Barney 1991). Here, the term *firm resources* is broadly construed to denote assets, capabilities, organisational processes, firm attributes, information, knowledge, and so on that are controlled by the firm and that enable it to conceive and implement strategies that enhance its efficiency and effectiveness (Daft 1983). When a firm's capabilities build on tacit knowledge and are rare, imperfectly tradable, and costly to imitate, they are the basis of superior performance (Barney 1991, 1995; Spender 1996). However, their strategic value to a firm will naturally erode over time as substitutes appear and new competitive problems emerge. Firms tend to initially respond to diminishing prospects by adapting existing capabilities or developing new capabilities from existing organisational knowledge (Leonard-Barton 1992). Should these responses prove unsatisfactory, a firm may turn to external knowledge sources in an effort to develop capabilities more divergent from those it currently employs.

The organisational learning framework focuses on collaboration as a response by organisations to environmental changes demanding improvement in their knowledge base or their technological capabilities. It builds on the assumption that the degree of heterogeneity in firms' capabilities is a major condition leading to cooperation among firms, where capability heterogeneity is defined as the breadth or diversity of capabilities (e.g., technological or marketing capabilities) that firms possess (Sakakibara 1997). Today's highly sophisticated innovations often depend upon work across several areas of science and technology (Hagedoorn 1993). Few firms have the breadth of knowledge required for such undertakings, making joint action necessary for the development of capabilities designed for competing in the future (Hagedoorn 1995). Cooperative relationships can thus be viewed as a vehicle by which firms overcome their resource constraints through the learning of skills and capabilities from other participants (Kogut 1988).

In explaining the reasons behind collaboration, the resource-based view extends the argument put forth by resource dependency theory by discussing how collaboration can be a more effective vehicle than internal development or market-based transactions for acquiring resources that have the potential to be sources of competitive advantage. In this perspective, sustainable competitive advantage comes from integrating and leveraging tacit

knowledge (Conner and Prahalad 1996; Grant and Baden-Fuller 1995). However, the 'tacit' nature of a firm's knowledge base, particularly technological knowledge, means it is not easily transferred across a firm's boundaries (Polyani 1958, cited in Sakakibara 1997). Indeed, one of the most widely cited motives for collaboration is the acquisition of new technical skills or technological capabilities from partner firms (Hagedoorn 1993; Hamel 1991; Hamel, Doz, and Prahalad 1989; Shan 1990). The resource-based view literature argues that the procedures and competencies used by R&D and the development of technological capabilities are likely to be highly specific to organisations and the technologies they employ. They may also be embodied in organisational routines and are subject to considerable uncertainty concerning their characteristics and performance (Barney 1991; Dierickx and Cool 1989). These features make it difficult to draft simple contracts governing the sale or licensing of such capabilities[2], making many of these capabilities non-tradable (Mowery 1983; Pisano 1990). Collaborative relationships have advantages over conventional contracts or markets for this task because they provide access to other firm's skills and capabilities and opportunities for learning that the latter approaches can't provide. Learning such complex knowledge requires face-to-face interaction between 'student' and 'teacher'; i.e., the interorganisational learning of alliances, not the vicarious learning of competitor intelligence or bench-marking (Lane and Lubatkin 1998). Through collaboration, a partner may internalise the skills or competencies of the other(s) to create next-generation competencies (Hamel 1991). In this context, cooperative strategies can become an indispensable mechanism for learning (Kogut and Zander 1992; Westley 1988). However, as Hamel's work (1991) suggests, while collaboration gives firms the opportunity for developing capabilities through this type of learning, firms must be intent on achieving such learning for it to be realised. Often, where firms do not incorporate a learning intent into their collaborative goals, the most a firm will realise is the substitution of their partner's competitiveness in a particular skill area for their own lack of competitiveness (Hamel 1991).

From the resource-based view, then, the value of collaborative arrangements is the provision of a superior means to gain access to technological and other complex

[2] Other firm-specific capabilities include knowledge of specific markets or user needs, idiosyncratic, firm-specific 'routines', such as decision-making techniques or management systems, access and knowledge of international markets, and complex networks for handling the marketing and distribution of products.

capabilities, which in turn, can be used to leverage the firm's competitive position *vis-à-vis* its rivals.

Cost Minimisation

The efficiency motive is a further factor that might lead firms to collaborate rather than remain independent. Transaction costs theory captures the efficiency motive, which holds that firms will collaborate, rather than adopt other strategic options, only if the sum of production and transaction costs in so doing are less than those for the other options (Williamson 1985). Transaction costs refer to the expenses incurred for writing and enforcing contracts, for haggling over terms of contingent claims, for deviating from optimal kinds of investments in order to increase dependence on a party or to stabilise a relationship, and for administering a transaction (Kogut 1988). The transaction cost approach emphasises cost minimisation by focusing on organisational and contracting efficiency (Williamson 1975). Production costs may differ between firms due to scale of operations, to learning, or to proprietary knowledge.

The underlying assumption of transaction cost analysis is that the environment in which firms operate is not characterised by perfect competition where market-based exchanges are the most efficient means of carrying out transactions. When imperfect conditions prevail, firms must choose between market-based transactions governed by price mechanisms and the possibility of exploitation and internalising transactions through either alliances (quasi-integration) or direct ownership (integration) and governing them through the firm's internal hierarchical control structure (Williamson 1991a). A number of researchers have argued that joint action can lower transaction costs (Dyer 1997; Kogut 1988; Sriram et al. 1992).

The contribution of transaction cost analysis to discussing the performance implications of collaboration lays primarily in its ability to understand the performance benefits of vertical, customer-supplier relations. The strategic implications of vertical collaborative arrangements are important. It allows a firm to specialise in those activities of the value chain that are essential to its competitive advantage, reaping all the benefits of specialisation and focus, whilst allowing other activities to be farmed out to more efficient firms.

Market Access/Internationalisation

A particular motive for adopting a cooperative strategy and entering alliances is provided by the challenge of entering new international markets. Here the choice is one between (1) exporting, (2) entry via cooperative contracting such as licensing, franchising, counter-trade, and contract manufacture, and (3) investment in the target market through setting up joint ventures with local partners (Root 1994; Young, Hamill, Wheller, and Davies 1989). Many small firms are limited in their ability to expand overseas, due to a lack of sufficient information, know-how and capital. Often collaboration is the only viable form of internationalisation for small and medium sized firms (Kaufman 1995). Domestic/foreign alliances are an effective means for acquiring knowledge on local markets, access to useful contact networks and possible even a distribution system (Welch 1992). Cooperative arrangements among small, domestic firms may provide the critical mass necessary to make exporting a viable option, while also providing complementary resources that may otherwise have been lacking (e.g., a technology-oriented firm lacks the marketing capabilities to pursue overseas markets).

Speed to Market

Another motive behind the formation of interfirm collaborative agreements is the need for speed in reaching the market (Child and Faulkner 1998). In today's rapidly changing and increasingly complex business environment, first-mover advantages are becoming paramount, and often the conclusion of an alliance between a technologically strong company with new products, and a company with strong market access is the only way to take advantage of an opportunity in time. Competition is increasingly knowledge-based as firms strive to learn and to develop capabilities faster than their rivals do (D'Aveni 1994; Prahalad and Hamel 1990). Even if a company has sufficient funds to approach an opportunity through internal development, this may not lead to substantial market presence fast enough to take successful advantage of the opportunity. The time between the identification of a problem and its arrival may not allow the firm to internally develop the knowledge and capabilities needed to respond effectively (Dierickx and Cool 1989). Cooperation is the fastest means of achieving market presence to meet an opportunity, if the partners each have strong resources and competencies, but alone insufficient to achieve critical mass. This has lead to a shift from traditional resource or risk-sharing alliances to alliances with learning from partners as a primary goal (Hamel 1991; Huber 1991).

Through 'learning alliances' firms can speed capability development and minimise their exposure to technological uncertainty by acquiring and exploiting knowledge developed by others (Hamel 1991; Grant and Baden-Fuller 1995).

Motives Relating to the Strategic Behaviour Perspective

The strategic behaviour perspective refers to general concepts drawn from the strategy literature. "While this does not refer to a single, coherent, unified theory, ideas based on the strategic perspective have motivated many strategic alliances, so it is important to discuss its implications for performance" (Gordon 1999). Though transaction cost and strategic behaviour theories share several commonalities, they differ fundamentally in the objectives attributed to firms. Transaction cost theory posits that firms transact by the mode which minimises the sum of production and transaction costs, whereas strategic behaviour posits that firms transact by the mode which maximises profits through improving a firm's competitive position *vis-à-vis* rivals (Kogut 1988). The strategic behaviour perspective implies that collaborative relationships are motivated by the desire to shape competition and consolidate a firm's competitive position (Day 1995; Jarillo 1988). Collaboration, at least those that can be defined as strategic, take place in the context of a company's long term strategic plan and are intended to improve or dramatically change a company's position (Gray and Yan 1992; McGee et al. 1995; Webster 1992). The strategic behaviour perspective emphasises the performance outcomes related to market attractiveness and organisational power. These outcomes are related closely to outcomes derived from the resource-dependency and resource-based view of the firm perspectives (Gordon 1999), and include access to resources (Contractor and Lorange 1988; Porter and Fuller 1986) and cost and risk reduction (Contractor and Lorange 1988; Kogut 1988; Porter and Fuller 1986).

The four perspectives discussed in this section, resource-based view, transaction cost, resource dependence, and strategic behaviour provide distinct, though at times, overlapping explanations for collaborative outcomes. They capture the underlying motives that are attributable to most collaborative agreements. In the main, cooperation is a response by firms to maintain or improve their competitive position, which due to internal resource inadequacies cannot be achieved independently, in the face of external challenges, threats or opportunities.

Negative Outcomes Associated with Collaboration

Cooperation also can have harmful consequences for performance. Researchers have noted that collaborative relationships might cause problems for cooperating firms, including lost proprietary information, organisational disruption, and adjustment difficulties (e.g., Hamel 1991; Miles and Snow 1992; Miner, Amburgey, and Stearns 1990; Williamson 1991a).

Collaborating businesses risk losing critical proprietary information to their partners (Hamel 1991; Hamel et al. 1989; Jorde and Teece 1990). Although a firm in a collaborative relationship is often required to pool its resources and perform certain value chain activities jointly with its partner(s), it must also be concerned with safeguarding its proprietary skills from being appropriated by an opportunistic partner. Firms may lose valuable technical advantages or other proprietary knowledge to the partner through intentional and unintentional revelation of commercial secrets, which the partner may later use to erode the firm's advantage (Hamel 1991; Smith, Dickson, and Smith 1991; Varadarajan and Cunningham 1995).

In exchange for access to the resources, skills, or information of another firm, a partner in a collaborative relationship forgoes some flexibility and freedom of action or control over the scope of its activities (Donaldson 1995). Dependence may give rise to control of the focal organisation by the partner firm, resulting in a corresponding decrease in organisational autonomy (Aldrich 1979; Provan 1982). This loss of control may be greatest for small firms involved in relationships with larger companies, with large firms often behaving in a predatory manner (Smith et al. 1991). Adaptation difficulties may arise from high adjustment costs and the presence of interorganisational routines. Establishing and renewing cooperative agreements is often costly (Coase 1937), while firms also frequently develop routines that span organisational boundaries as they learn to collaborate (Frombrun 1988, cited in Mitchell and Singh 1997). This dependence on partners and the absorption of interorganisational routines may impose adaptation difficulties on firms involved in collaborative relationships (Weick 1979, p. 185-187; Williamson 1991a, p. 291). The risk to the firm is likely to be greatest in situations where a high level of flexibility and adaptability is required, such as when a firm loses a partner, or faces major environmental upheaval (Mitchell and Singh 1996; Singh and Mitchell

1996). Singh and Mitchell (1996) discuss how dependence on an ally may leave a firm in a precarious position if they lose a partner or experience a reduction in the effectiveness of a relationship and cannot replace the relationship with effective alternatives. However, how changes in cooperative relationships affect the performance of allied businesses has received little theoretical or empirical attention (Singh 1997). Excessive dependence on partners also means that collaborating firms risk emaciating firm capabilities in areas of activity ceded to the partner. Relationships that enable a firm to either broaden its product line or fill gaps in its product line through production-by-proxy agreements can indeed be beneficial, however, the perils of excessive dependence on such arrangements must be borne in mind. A web of such skill substitution collaborative relationships could conceivably lead to gradual erosion of a firm's capabilities, reducing the long-term viability of the firm (Varadarajan & Cunningham 1995).

Varadarajan and Cunningham (1995) also identify the time spent by management to negotiate, implement, and integrate interfirm relationships as a potentially significant cost to the firm. The process of developing the right basis for a collaborative relationship can mean that developments are delayed, manpower and resources tied up, and as a result, the possibility that technical or other first-mover advantages are lost (Smith et al. 1991).

Whilst the potential benefits of and motivations for entering cooperative relationships have been widely documented, little theoretical or empirical research exists to elucidate the relative efficacy of collaborative arrangements, in comparison with other organisational forms, in achieving these outcomes. The general argument pervading the alliance literature is that cooperation allows collaborating firms to achieve better performance. However, empirical evidence of this relationship has been limited (Smith et al. 1995), with few studies providing substantial evidence of performance improvements (Balakrishnan and Koza 1993; Berg, Duncan, and Friedman 1982; Dollinger and Golden 1992; Hagedoorn and Schaenraad 1994). It is to this body of research that I now turn.

Reviewing Empirical Evidence of Performance and Collaboration

Despite a relatively large body of research extolling the virtues of collaboration, few empirical studies have examined the collaboration-performance relationship. Scattered across several disciplines, there exists a small empirical literature that has investigated the relative performance implications of collaboration. This research has found only weak empirical relationships between collaborative activity and financial performance (e.g., Balakrishnan and Koza 1993; Berg et al. 1982; Dollinger and Golden 1992; Hagedoorn and Schakenraad 1994; McGee et al. 1995). The studies that have been conducted can primarily be split into two groups: investigations of performance implications for large and for small and medium-sized organisations. Related to this distinction, the empirical studies have mostly been conducted by researchers in the strategy discipline (Hagedoorn and Schakenraad 1994; Mitchell and Singh 1996; Singh 1997), whilst several have also stemmed from the small business literature (Brown and Butler 1995; Dollinger and Golden 1992; Golden and Dollinger 1993). There has been little, if any, empirical research of this nature in the marketing literature.

Corporate-level Performance

Much of the strategy research has examined the link between collaboration and corporate financial performance. Berg et al. (1982) examined the effect of joint venture activity on profitability, using empirical tests to examine both cross-firm and cross-industry effects. Results from their regression analysis show that joint venture activity tends to have a significant negative impact on profitability in chemicals and (mechanical) engineering but insignificant effects in the resource-processing sector. No significant long-term effects of joint venture activity on profitability were found in any industrial sector. Hagedoorn and Schakenraad (1994) examined the effects of strategic technology alliances on company performance. Their research did not generate any straightforward relations between strategic technology partnering and company performance, but did provide some useful insights into improving the understanding of the effects of strategic technology alliances. Their results indicated that companies attracting technology through their alliances and companies concentrating on R&D cooperation have significantly higher rates of profit.

More recently, Combs and Ketchen (1999), investigated the link between cooperation and performance in the United States restaurant chain industry. Incorporating both resource-based and organisational economic views in their research, they examined the interaction of exchange conditions, interfirm cooperation and firm performance. They predicted that there would be a positive impact on performance for firms using interfirm cooperation when exchange conditions made this an appropriate choice. Conversely, they expected firms involved in cooperation to perform worse than firms that remain independent do when exchange conditions point toward full ownership. Combs and Ketchen's results provided mixed evidence for these hypotheses: while an interaction effect was found, the relationship was not as simple as predicted. When exchange situations suited full ownership, firms involved in collaboration performed worse in terms of return on assets (ROA) and market-to-book value, however, collaborating firms did not perform better than independent firms when exchange conditions suited collaboration. Their study suggested that collaboration, at least in the short-run, has potentially negative performance implications in some exchange conditions, but does not have any positive effects in exchange conditions that should have promoted collaboration as an effective strategy. However, several issues related to Combs and Ketchen's study make it difficult to generalise their results. First, interfirm cooperation referred to franchises and joint ventures, which have many idiosyncratic features not relevant to the majority of types of collaboration subsumed under collaborative relationships (Mitchell and Singh 1996). Second, market-to-book value was used as one of their two performance measures; a measure which is difficult to interpret in terms of its link with cooperative relationships, while also being an irrelevant performance indicator for many firms, particularly for smaller firms that are not listed on the stock market.

These studies have found only weak empirical relationships between collaborative activity and corporate financial performance. However, the emphasis placed on corporate performance in these studies (Berg et al. 1982; Combs and Ketchen 1999; Hagedoorn and Schakenraad 1994) may mask stronger business-level collaboration-performance benefits (Singh 1997; Mitchell and Singh 1996).

Collaborative Activity and Business Survival

Rather than investigating the link between collaboration and profitability, Mitchell and Singh (1996) investigated the survival implications of cooperation. They believe that studies of profitability are constrained to studies of surviving firms, while collaborative activity may actually influence the ability of the firm to survive. Mitchell and Singh's (1996) study investigated the link between collaborative activity and business survival for businesses commercialising complex goods. They investigated the relative impact of the benefits and problems of collaboration on the survival of businesses commercialising complex goods in the Hospital Software Systems Industry. They tested for empirical differences between business survival and three different types of relationships: development-oriented-, marketing-oriented-, and other interfirm-relationships. Their results show that businesses using either development-oriented or marketing-oriented collaborative relationships are less likely to shut down in any given year than are firms that remain independent. In contrast, however, they found that businesses that licensed technology to others or had unknown types of relationships were more likely to shut down, suggesting that the selling of technology to other businesses may be a sign of business weakness.

Mitchell and Singh's (1996) study also investigated the potentially negative consequences of collaborating. They examined the impact of an environmental shock on the survival rate of firms. Following an environmental shock, firms with collaborative agreements for activities outside the focus of the shock become even less likely to shut down. However, firms with collaborative agreements for activities that were at the focus of the shock had their earlier dissolution advantages reversed, becoming more likely to shut down than did firms that had remained independent. In a similar reversal, businesses taking independent commercialisation approaches lose at least part of their inferiority when a shock occurs. Mitchell and Singh's results suggest that collaboration is usually beneficial but can sometimes turn on the user. Development-oriented and marketing-oriented collaborative relationships appear to help businesses acquire needed commercialisation capabilities, but firms risk becoming locked into obsolete capabilities following a shock if they become dependent on a partner.

In a study of the same industry, Singh (1997) investigated the impact of alliances on the

relationship between technological complexity and business survival. The study evaluated the benefits of alliances by contrasting the failure risks of businesses that independently or cooperatively developed products of varying technological complexity. The results indicated that medium complexity-technology firms with technology alliances had lower risks of failure than other businesses. However, neither technology nor non-technology alliances had positive survival impact for firms commercialising high- or low-complexity technologies. In general, the results provided only partial support for the hypothesis that collaboration benefits firms in terms of firm survival. The results of Singh's study demonstrate that some businesses can moderate technological challenges by collaborating with other firms on technological issues. However, this result was conditioned by the technology being appropriately complex. Moderate levels of complexity were seen to allow businesses to benefit from collaboration, without the complexity overwhelming the gains from collaboration, or the costs of collaboration offsetting potential benefits.

Small and Medium-Sized Firms

Dollinger and Golden (1992) explicitly attempted, but failed, to find a relationship between cooperative strategy and performance in small manufacturing firms. Using a contingency approach, they investigated the relationship between interorganisational relationships and firm performance, accounting for various environmental characteristics (munificence, dynamism, and complexity). When performance was measured by growth in sales, they found interorganisational relationships had a marginally significant, positive association. However, collective strategy had no impact on performance when measured as either relative competitive position or operating margin.

In another study using similar data, Golden and Dollinger (1993) investigated the relationship between the use of interorganisational relationships, the strategic posture of firms, and small firm performance. Adopting Miles and Snow's (1978) strategic adaptations typology (defender, prospector, analyser, and reactor), they investigated whether a discernible relationship exists between the use of interorganisational relationships and the strategic posture of a firm that would lead to improved small firm performance. Their results, however, did not find any relationship between cooperative strategies and performance (as measured by three-year growth in reported sales and net margins). Both of these studies, however, had methodological flaws. The performance

data used was the last complete year of financial results available prior to the time of the study, however, respondents were asked to indicate any cooperative arrangements that their firm currently had. Thus, no provision was made to establish whether these arrangements existed prior to the period covered by the performance data. Thus, these studies more adequately describe the relationship between prior performance and current use of cooperative arrangements.

Brown and Butler (1995) examined whether firms involved in stakeholder- and/or competitor-networks were associated with higher growth in sales and higher profitability than those firms who were not involved in any such networks. Focusing on entrepreneurial firms in the US wine industry, they investigated the relationship between time spent building several types of networks (publicity, distribution, suppliers and competitors) and two measures of performance. None of the network-building activities were statistically related to profitability. For growth in sales, only one type of network activity, competitor networks, was strongly associated with increased sales. However, several methodological considerations, including a small sample size, low reliabilities for the independent variables used in the analysis, and single item, perceptual measures of performance, combine to reduce the validity of Brown and Butler's results.

The most comprehensive examination of the effects of collaborative activity for small firms comes from a study conducted by McGee et al. (1995). Taking into account the role of business strategy and management experience, McGee et al. investigated the impact that cooperative strategy might have on new venture performance. They tested the relationship between performance, prior functional experience, and the use of specific types of functional cooperative arrangements given the venture's choice of competitive strategy. The three types of competitive strategy used were marketing differentiation, technical differentiation, and cost leadership. For each type of competitive strategy, McGee et al. investigated the impact on performance (growth in sales) of cooperative arrangements aligned with the type of strategy being used (e.g., for firms using marketing differentiation, they investigated the impact of marketing cooperative arrangements on performance).

The use of marketing cooperative activities was found to be beneficial to all firms pursuing marketing differentiation. Moreover, the relationship between higher average sales growth

and marketing cooperative behaviour was consistently stronger when the venture's management team possessed relatively more marketing experience. This result suggested that cooperative activities were beneficial regardless of the experience of the new venture's managers, but were most beneficial when managers had more extensive marketing experience. For firms emphasising cost leadership strategies and using manufacturing cooperative activities, the results were similar to the marketing subsample; i.e., cooperative arrangements were increasingly beneficial over the range of manager experience. However, for ventures emphasising technical differentiation, the use of R&D cooperative behaviour detracted from performance. However, when the interaction between cooperative behaviour and managerial experience was analysed, it showed that the use of R&D cooperative behaviour was associated with substantially higher performance when the management teams possess relatively more technical expertise. In this case, firms with inexperienced technical managers pursuing cooperative R&D activities actually had worse performance. Only firms with relatively experienced managers saw benefits from collaboration. McGee et al.'s (1995) results suggest that the benefits of collaboration can only really be leveraged if firms have the managerial expertise to do so. Firms with inexperienced management pursuing cooperative strategies may well have deleterious performance outcomes, a point also raised in research by Dollinger and Golden (1992) and Mitchell and Singh (1996).

Other Outcomes of Collaborative Relationships

There has been little research examining the effects of collaboration on non-economic performance outcomes (e.g., product innovation, speed to market, etc.). Kotabe and Swan (1995) investigated the role that cooperative business relationships have on product innovativeness. Their results showed that there appears to be a disadvantage to cooperating with other firms in developing and introducing more innovative products. However, their findings should be interpreted cautiously as the explanatory power of their regression models was relatively weak. Their findings did suggest, however, that horizontal cooperative relationships tend to increase the level of innovativeness of their product more than vertical cooperative or single-firm strategies.

In general, as the previous discussion illustrates, research on collaboration has been unable to provide significant empirical evidence on the relative efficacy of collaboration, (Singh

1997; Smith et al. 1995), with the findings of research examining the collaboration-performance relationship at best equivocal. These results have provided only partial support for the widely accepted proposition that collaboration improves the performance of participating firms. These findings are notable for two reasons. First, the proposition that collaborative agreements have a positive-business level performance impact has to date not yet received adequate empirical evaluation (Smith et al. 1995). Second, several of the extant studies suggest that there are significant limits to business performance gains from cooperation (Hagedoorn and Schakenraad 1994; Singh 1997). Collaborative strategies may not necessarily be valuable for all firms or in all circumstances. On the contrary, they may only be beneficial under relatively narrow circumstances. Moreover, as noted by Smith et al. (1995), most of the writing on cooperation has tended to have a very positive tone. However, as the earlier section on the potential problems of cooperation elucidated, cooperation can have harmful consequences for performance. The small empirical literature has generally failed to consider the costs of collaboration in their studies. Only the work of Mitchell and Singh (Mitchell and Singh 1996; Singh and Mitchell 1996; Singh 1997) has empirically investigated the potential costs of collaboration. Thus, another possible reason for the equivocal empirical nature of the evidence could be the countervailing forces of collaboration resulting in a negligible net effect on performance. Finally, the previous discussion emphasises the difficulty inherent in examining the collaboration-performance relationship. Since many other activities besides the collaborative activity of firms can also influence the performance of firms, it can be difficult to link the cooperative activity of firms with their performance. "From a theoretical perspective, there is clearly a need for more critical and empirical examination of the costs and benefits of collaboration" (Singh 1997, p.360).

Conceptual Framework and Research Hypotheses

The previous sections discussed the theoretical foundations of the performance benefits of collaboration and outlined the advantages and disadvantages of independent and collaborative approaches to competitive advantage. In the following sections, I develop a conceptual framework that integrates theoretical and conceptual studies that have focused on collaboration with the empirical research that has examined the link between firm performance and collaborative activity (see Figures 1 & 2). This framework identifies two categories of variables that have been proposed by various researchers to have direct or moderating effects on firm performance, in conjunction with collaboration: (1) environmental characteristics; and (2) the strategic orientation of the firm. Two levels of analysis are investigated. The first level of analysis, depicted in Figure 1, investigates the general effects of collaboration on performance relative to independent firms. The second level of analysis, illustrated in Figure 2, compares the relative efficacy of various types of collaboration as well as comparing the performance effects of these types of collaboration with independent firms.

The New Zealand Business Context

Before hypotheses can be stated, it is important to identify and describe the context under investigation. Hypotheses were tested by examining the performance of firms across a wide variety of sectors in the New Zealand economy. It includes domestic and international collaborative relationships involving New Zealand firms. By most definitions, New Zealand would be regarded as a nation of small business: small and medium-sized enterprises (SMEs) make up 99.5 percent of all enterprises[3] (i.e., firms with fewer than 100 employees). Following deregulation of the New Zealand market in 1985, reductions in tariffs and import quotas have exposed New Zealand firms to greater international competition in both the domestic market and export markets. Competition from overseas players has meant that New Zealand firms have had to develop new strategies to react to these changes and enhance their competitiveness. In many industries, firms have looked to expansion into overseas markets for continued growth and profitability. However, being a nation of predominately small and medium-sized firms, many businesses have not had the resources to pursue overseas markets alone.

[3] Labour Market Statistics 1997 (Statistics New Zealand 1998).

FIGURE 1
Proposed Model for Investigating the Performance Effects of Collaboration

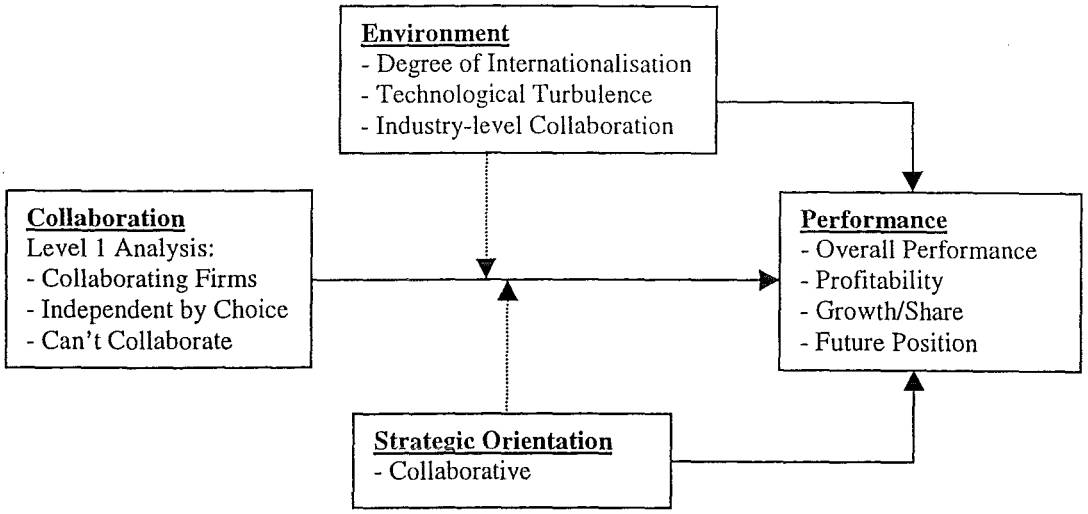
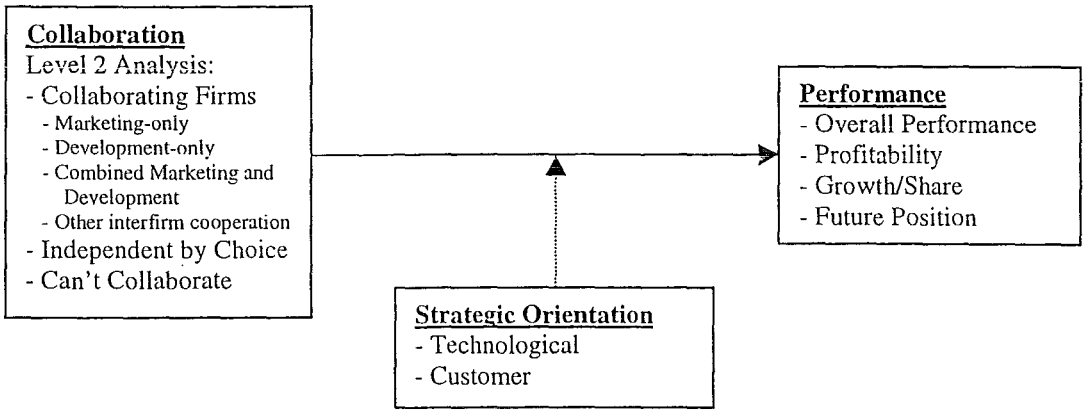


FIGURE 2
Proposed Model for Investigating Impact of Type of Collaboration



For these firms, interfirm collaboration has been argued to be one of the most rapidly emerging mechanisms for enhancing competitiveness (Rosenfeld 1996). Indeed, the New Zealand Government, recognising the success of interfirm cooperation among small and medium-sized firms in countries such as Italy and Denmark, has instigated various assistance programs designed to encourage and develop cooperation amongst New Zealand firms (Benson-Rea and Wilson 1994; Brookes, Lindsay, and Williams 1998). Although there are a growing number of local and national efforts to encourage and accelerate interfirm collaboration, there have been few systematic studies of their impacts.

The Link Between Performance and Collaboration

My first question is whether the benefits of collaboration outweigh the problems associated with collaboration, and hence whether firms involved in collaborative relationships should outperform firms taking independent approaches. Critical to the competitive position of firms are the resources and capabilities they have available to them in order to compete in the marketplace (Barney 1991). Firm-level competitive activity, and hence firm performance (D'Aveni 1994) is a function not only of the resources a firm directly owns, but also of resources it can access from relationships and interactions with other firms in the environment (Lenz 1980). The Literature Review discussed how collaborative relationships give participating firms access to both tangible and intangible complementary resources, including knowledge, technology and/or physical assets. Moreover, not only do they provide a mechanism for accessing resources, but more importantly, they also allow firms to gain tacit or sticky resources or knowledge that are more effective in developing future capabilities and a superior competitive position (Barney 1991; Wernerfelt 1984). Cooperative relationships allow participating firms to leverage and potentially internalise partner firm(s) resources and/or capabilities in order to compete for position more economically than firms that must acquire resources unilaterally (Young, Smith, and Grimm 1996). Thus, cooperative mechanisms enable participating firms to undertake more competitive activity than is possible with the resources accessible to any participant alone (D'Aveni 1994, Nielsen 1988).

However, in a world of perfect information and unconstrained choices, the mere acknowledgement of this strategic generalisation would lead all firms to try to establish collaborative relationships. Managers are unlikely to follow the inferior independent

approach and will attempt to select forms of collaborative agreements that suit the conditions that exist when the choice of which organisational form to adopt is made (Masten 1993). In practice, however, managers are often faced with constraints that affect their ability to create collaborative relationships. Firms that would benefit from collaborative relationships sometimes are unable to find appropriate partners. Organisational practices and policies sometimes keep managers from undertaking actions that would be beneficial in particular business situations (Hannan and Freeman 1989; Nelson and Winter 1982). Moreover, organisational decisions often take place in rapidly changing environments and it is sometimes not possible to determine optimum organisational modes in the available time (Amit and Schoemaker 1993; Williamson 1991b). If constraints are common, then the decision to enter a collaborative relationship or remain independent might affect the performance of one firm relative to it competitors.

Firms often form collaborative relationships because they lack the ability, time or money to internalise the skills and capabilities necessary to achieve the objectives of the firm. Given the frequency with which firms are entering collaborative relationships, and the fact that the bulk of the discussion put forward by the various theoretical perspectives suggest that the benefits of collaborating should outweigh the problems, collaboration should have positive performance benefits. Thus, if some businesses are constrained from entering desirable collaborative relationships, those firms that do form relationships will tend to achieve superior performance.

Hypothesis 1: Firm performance will be greater for firms that collaborate than for firms that remain independent.

Hypothesis 2: Collaboration will improve firm performance.

These two hypotheses are distinct: Hypothesis 1 proposes that firms involved in collaboration will have higher levels of current performance, whereas Hypothesis 2 acknowledges that even if there are no differences in current performance, collaboration may, over time, be able to improve firm performance. Thus, even if Hypothesis 1 is not supported, support for Hypothesis 2 would still have important implications for managers of firms: managers could *improve* their firm's current position by entering a collaborative

relationship.

I will also investigate whether the number of collaborative relationships that a firm uses influences its performance. Positive performance outcomes might become more likely as the number of collaborative relationships increases, especially if multiple relationships provide firms with access to a broader set of skills. Conversely, any problems associated with collaborative relationships might be exacerbated if a firm creates relationships with many organisations (Mitchell and Singh 1996). Increasing the number of relationships will also require that more extensive co-ordination systems and interorganisational routines be established, creating further constraints on organisational adaptability. Because of the opposing influences, I will examine the impact of the number of relationships as a research question.

I will control for firm size and prior performance when examining the impact of collaboration. Large firms are likely to form more collaborative relationships than small businesses with narrow product lines. Additionally, within the context of a single industry, it is possible that the incentive to enter an alliance is a function of firm performance. As such, any observed associations between collaboration and performance might result from the performance of the business before it formed a collaborative relationship rather than from the collaboration (Mitchell and Singh 1996). Bolton (1993) suggests in her research that a prime motivator for becoming involved in cooperative activity, particularly in innovative R&D, is current poor performance. This may lead the top management of an organisation to seek out means of changing their formula for competing in the market. Cooperation is a readily available means of doing this. As such, poor performing firms will have a strong incentive to join alliances, as there is little to be lost by doing something different to try to improve flagging results. Such an incentive is much weaker when things are currently going well, although an alliance may still be considered to address a deficiency that is thought likely to impact on performance in the longer term. Bolton's (1993) research found that poor performers were early joiners of R&D collaborations, whereas good performers were late joiners. In such cases, any observed association between collaboration and performance would stem from the prior weakness rather than the collaboration. Alternatively, strong businesses might tend to form collaborative relationships because the strong firms are particularly desirable partners, in which case an

association between collaboration and firm performance would stem from prior strength.

Performance of Firms that Can't Collaborate

The previous hypotheses pointed to the relative performance benefits of collaboration compared with remaining independent. However, given the possibility of competitive responses (e.g., independent firms entering collaborative arrangements of their own), it is argued that it is difficult for an empirical strategic generalisation such as this to persist for any length of time. Wensley (1992, cited in Boulding and Staelin 1995) reasons that if strategic generalisations exist, knowledge of these generalisations would lead firms to compete away any of the advantages implied by the generalisation. For example, if collaboration leads to supranormal profits, then, upon learning about this generalisation, firms will seek out their own collaborative agreements. Ceteris Paribus, this would allow these firms to acquire competitive parity with those firms already collaborating. Thus, for the proposed performance differential between collaborating and independent firms to exist, one or both of the following conditions must hold: (1) only a few firms in an industry are involved in collaborative relationships (see the discussion on industry-level collaboration below) or (2) managers must face constraints that affect their ability to enter collaborative relationships. In the following sections, this second condition, which framed the discussion of the previous hypotheses, will be elaborated upon.

Given the above logic, it is necessary to consider situations that might exist whereby conditions are such that knowledge about excess returns to collaboration does not enable all firms to collaborate, and thus does not compete away the excess returns of cooperating firms. At the base level, firms adopting independent approaches can be categorised into two subgroups:

1. those firms that choose to remain independent, and
2. those firms that would like to collaborate but are unable to do so.

When partitioning independent firms based on their reasons for not collaborating, a richer level of analysis can be conducted when investigating the performance implications associated with collaborating and non-collaborating firms. I expect firms that would like to be involved in collaboration but are unable to do so to perform worse than either firms

that are collaborating or firms that have 'chosen' not to collaborate. Whilst there has been an increase in the number of studies investigating the motives for firms entering collaborative agreements, there is a dearth of research examining the reasons behind firms remaining independent. Given the current pervasive nature of collaboration, it seems appropriate to ask managers of firms who don't collaborate why they don't collaborate (Human and Provan 1997), and to determine if there are any performance implications associated with different groups of non-collaborators.

The distinction between firms that choose to remain independent and firms that can't collaborate is important. The distinction reflects that the former reason for not collaborating is a conscious decision made by the firm, whereas the latter reason is a response to either internal or external conditions that do not allow the firm to collaborate, even though it desires to do so. Several interrelated internal and external factors, which are discussed below, may constrain firms who wish to collaborate from doing so.

1. Difficulty of Finding Appropriate Partners

Firms that would benefit from collaborative relationships sometimes are unable to find appropriate partners (Mitchell and Singh 1996; Varadarajan and Cunningham 1995). Several factors may combine to make it difficult for firms to enter collaborative relationships.

1a. The Situation of a Finite Set of Complementary Firms

Within any industry, or even across industries, a limited number of valuable linkages may exist, where valuable is defined as aiding in improving the efficiency and/or effectiveness of the firms involved. This might be because there are only a certain number of possible pairs of firms (or sets of firms) that have complementary resources that are likely to make the relationship a value-added one. Whilst there may be room to establish relationships with other firms in an industry, the resources and competencies of both the focal firm and the potential partner firm could mean these linkages are obviously inappropriate. Once the valuable linkages in an environment are saturated, there is little point in entering a relationship when there is little hope of it being successful. In such a case, firms have the motivation, but lack the ability to enter collaborative activity. Thus, when the number of firms possessing complementary skills and resources is limited to a small set, it is

conceivable that the early entrants forming collaborative relationships would enjoy a competitive advantage *vis-à-vis* firms locked out of opportunities for entering into similar relationships for lack of firms possessing complementary skills and resources (Varadarajan and Cunningham 1995).

1b. Diminishing Returns to the Number of Collaborative Linkages

Another factor that could result in some firms being unable to establish alliances is the possibility that there may be a limited number of viable collaborative linkages a firm can maintain. Thus, while it is theoretically possible for each firm in an industry to have up to *n-1* (where *n* equals the number of firms in the industry[4]) relationships, in reality this is unlikely to be the case. Firms will begin to find the costs of coordination and other costs associated with collaboration escalating as the number of linkages increase (Mitchell and Singh 1996). This is especially relevant for smaller businesses, which have limited managerial and financial resources to maintain multiple linkages. As the number of agreements increase, the marginal costs of collaborating begin to outweigh the benefits of coordination. Due to diminishing returns, then, firms are likely to limit the number of relationships they enter, thereby potentially locking out firms who might have wished to collaborate.

The combination of a finite set of complementary firms and diminishing returns to collaboration means that there may be a limited number of viable interconnections amongst a set of firms and once these are established, outsiders are locked out, thereby maintaining the performance differential between firms that collaborate and those that don't. It is not until something goes wrong among members of an existing network of relationships that outsider firms get the opportunity to try to forge an agreement with one of the insider firms (Varadarajan and Cunningham 1995).

1c. Lack of Reciprocity

Reciprocity can be thought of as an umbrella term, capturing all the reasons why other firms might choose not to participate in a relationship with a focal firm, even though these firms may have both the resources available to collaborate and capabilities that would be

[4] Since many collaborations are cross-industry, the number of possible relationships would be much greater

complementary to the focal firm's own set. The first reason why reciprocity might not exist is the social/competitive structure of current networks of relationships within an industry. Even if you didn't have diminishing returns to collaboration, the social embeddedness of the existing industry structure could mean that managers are unable to get the firm with whom they wanted to collaborate (Gulati 1998). For instance, consider an industry with five firms: A, B, C, D, and E. Currently, A, B, and C are collaborating together, while firm D has links with firms B and C. Until now, firm E has remained independent, however, firm E now wishes to enter an agreement with firm D, which has also expressed its interest. Historically, firms C and E have had a hostile relationship. If firm C puts the hard-line on firm D to not collaborate with firm E, and firm D values their relationship with firm C, then the structure of the existing industry ties may result in firm E being unable to collaborate with firm D, the partner they desired. Another, more immediate, reason for firms being unwilling to collaborate could be the past performance of the focal firm. If historically, a firm has a reputation for being a poor partner or for being a poor performer, then it is unlikely be a very attractive partner for other firms interested in collaborating (Gulati 1998, Mitchell and Singh 1996).

2. Internal Resource Constraints

A firm's ability to cooperate is in part determined by the degree of resource abundance and the capacity of the internal environment to support growth. A lean environment deprives the small firm of the resources required for strategic flexibility; hence decreasing the ability of the firm to enter collaborative agreements (Aldrich 1979; Sharfman, Wolf, Chase, and Tansik 1988). Without slack resources such as money, human resources, managerial time, or excess capacity, the firm is unable to extend itself into collaborative arrangements (Dollinger and Golden 1992). In this case, the firm is motivated, but lacks the ability to be involved in collaboration with other firms.

3. Organisational Constraints or Environmental Conditions

Organisational practices and policies sometimes keep managers from undertaking actions that would be beneficial in particular business situations (Hannan and Freeman 1989; Nelson and Winter 1982). However, such policies are often in place because they are

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than n-1, however, the general argument still holds.

believed by top management to reflect the best interests of the firm. Organisational decisions also often take place in rapidly changing environments and it is sometimes not possible to determine optimum organisational modes in the available time Amit and Schoemaker 1993; Williamson 1991b). The environmental context in which a firm operates may also affect the decision on whether or not to collaborate. Very stable or benign environments will not necessitate collaboration because they reduce many of the major motivations for entering such relationships (Dollinger and Golden 1992).

Firms that do not collaborate based on either firm policy or environmental conditions do so consciously believing that this is the best decision for the firm given the current climate and information available. However, managers of firms, which are constrained by either their inability to find an appropriate partner or their inability to muster up the necessary resources to initiate collaboration, acknowledge that collaboration would have been beneficial to their firm. Thus, for firms who would like to partner, but are unable to either summon the resources to do so or find a partner that possesses complementary capabilities, I would expect their performance to be lower than firms who have consciously made the decision not to collaborate.

> *Hypothesis 3a: Of those firms that do not collaborate, firms that can't collaborate will have lower performance levels than firms that choose not to collaborate.*

Moreover, given Hypotheses 1 and 2, I must also have:

> *Hypothesis 3b: Firms that can't collaborate will have lower performance levels than firms that do collaborate.*

Moderators of the Strength of the Relationship

Prior research has acknowledged that potentially external environmental factors can moderate the extent of collaboration's effects on business performance (Dollinger and Golden 1992; Singh 1996). The environment influences collaborative strategy by affecting both the ability of firms to comprehend the rewards for cooperative versus competitive behaviour and by determining the importance of collaboration itself (Dollinger 1990;

Grant and Baden-Fuller 1995). Environmental characteristics that have theoretically been related to how beneficial collaboration may be to a firm include environmental uncertainty, complexity, degree of internationalisation of markets, and munificence (Burgers, Hill, and Kim 1993; Dollinger and Golden 1992; Grant and Baden-Fuller 1995). Research investigating factors influencing the formation of interfirm collaborative relationships has shown that the environmental context has a direct effect upon the use of many alliance relationships (Child and Faulkner 1998; Dollinger and Golden 1992; Hagedoorn 1993). Implicit in this discussion of the environmental context is the assumption that there will be greater performance benefits to collaborating (compared with market transactions or independent methods) in certain types of environments. Whilst there has been some empirical evidence confirming the relationship between the environment and the use (or extent) of interorganisational relationships (e.g., Dollinger and Golden 1992; Dickson and Weaver 1997), there has been little empirical research conducted to see if the environmental context does in fact moderate the collaboration-performance relationship.

Environmental Uncertainty

Environmental uncertainty is defined by Milliken (1987) as the perceived inability of an organisation's key manager or managers to accurately assess the external environment of the organisation or the future changes that might occur in that environment. The change and unpredictability inherent in environments characterised by such uncertainty present information and resource challenges to firms. Since acquiring and integrating knowledge and other resources takes time, the firm must make investments whose returns are uncertain (Grant and Baden-Fuller 1995). Collaboration is a mechanism for dealing with this uncertainty and maintaining a competitive position in the marketplace. Firms may seek to limit investment commitments and, hence, risk by forging collaborative relationships with other companies, thereby expanding information networks, competencies, and resources available to the firm. Firms facing uncertain environments therefore have the motivation to couple themselves more tightly with organisations that control critical resources, thereby reducing variability (Dollinger and Golden 1992). For example, manufacturer-dealer networks decrease risk by contractually arranging for resource acquisition and disposal.

Both Buchko (1994) and Milliken (1987) have argued that perceived environmental

uncertainty, often assumed a unitary construct, is in reality multidimensional. Dickson and Weaver (1997) propose that environmental uncertainty is a multidimensional construct that can be characterised by the source of the uncertainty. Having examined existing alliance research, they suggest that there are five specific sources of environmental uncertainty: general, or effect uncertainty, technological uncertainty, state uncertainty (e.g., market turbulence), growing demands for internationalisation, and key managers' lack of faith in their ability to assess future potential for growth and profits in their industry. Hypotheses regarding three of these sources of uncertainty: market turbulence, technological turbulence and degree of internationalisation will be developed. These three factors were chosen as they represent actual conditions that are often related with the use of and motives for collaboration (Burgers et al. 1993; Dollinger and Golden 1992) and are expected to influence the importance of collaboration as a strategy. Moreover, they are factors that many New Zealand firms face; when to use collaboration, if at all, in managing these conditions, is a key question for top managers. The other two factors, while being sources of greater uncertainty, refer not so much to the conditions or realities present in the marketplace, but more to the ability of managers to determine the nature of the environment in which they are operating. As such, these sources of uncertainty are unlikely to interact with collaboration to impact performance.

Market Turbulence

Milliken (1987) gave the label "state uncertainty," to the perceived inability to predict a particular component of the environment, such as the actions of competitors or the demands of customers. Demand uncertainty, or market turbulence, is the uncertainty that arises from unpredictable changes in consumer purchasing patterns (Burgers et al. 1993; Kaworski and Johli 1993). The turbulence in the market is typically generated by heterogeneity in consumer preferences. Harrigan (1988) suggested that the level and form of market turbulence play critical roles in a firm's choice to engage in cooperative behaviour. To survive in an uncertain environment firms must be able to adapt quickly to changing market conditions (Burgers et al. 1993). In general, the less predictable a leader believes the market for his or her firm to be, the more likely it is that he or she will be motivated toward alliance use. By enabling the firm to quickly gain access to key strategic capabilities, collaborative relationships help firms to cope with unpredictable changes in consumer purchasing patterns.

Hypothesis 4: The greater the level of market turbulence, the greater the performance benefits of interfirm collaboration compared with independent approaches.

Technological Turbulence

The second environmental factor that is posited to moderate the relationship between collaboration and business performance is technological turbulence. Technological turbulence has been defined as the rate and extent of technological change (Jaworski and Kohli 1993). In the face of major discontinuities in the technological environment, firms are likely to find themselves lacking in the broader set of skills and resources needed to effectively compete. Collaboration is one way to mitigate these environmental conditions. Recent alliances between firms in industries such as computer hardware, computer software, telecommunications, and television entertainment industries illustrate this point. Research has shown that the formation of alliances is associated with the technological complexity and volatility inherent in an industry (Forrest 1990; Hagedoorn 1993; Hladik 1988). Devlin and Bleackley (1988) argue that it is the rapid pace of technological development and the associated high costs that underlie the motive to cooperate. Firms in high technology industries are usually faced with unfamiliar research techniques, products and/or processes. As the change and unpredictability of the environment increases, it becomes more difficult for firms to monitor and keep abreast of changes occurring in the environment (Forrest 1990). The time between the identification of a problem and its arrival may not allow the firm to internally develop the knowledge and capabilities needed to respond effectively (Dierickx and Cool 1989). Through collaboration, firms can speed capability development and minimise their exposure to technological uncertainty by acquiring and exploiting knowledge developed by others (Grant and Baden-Fuller 1995). To be complete, I incorporate the direct effect of technological turbulence on firm performance.

Hypothesis 5a: The greater the level of technological turbulence, the greater the performance benefits of interfirm collaboration compared with internalisation.

Hypothesis 5b: Technological turbulence exerts a direct, negative effect on firm performance.

Degree of Internationalisation

The third source of perceived uncertainty is growing demands for internationalisation (Contractor 1986; Dickson and Weaver 1997; Koeplfler 1989). Ohmae (1989, p.154) maintains that, for many industries, the "relentless challenges of globalisation will not go away." These demands, in Ohmae's view, "mandate alliances, making them absolutely essential to strategy" (1989, p.143). While this is rather an extreme view, past research has indicated important links between international trade and alliance use (Dickson and Weaver 1997). As the demands for internationalisation increase, firms will need to look at viable ways of expanding operations overseas. Often the only feasible avenue for involvement in international trade, particularly for smaller firms, is through alliance use (Morriss and Hergert 1987; Welch 1992).

Hypothesis 6: The greater the extent to which internationalisation is deemed necessary for firm success, the greater the performance benefits of collaboration compared with remaining independent.

Industry-level Collaborative Activity

Dollinger and Golden (1992) discuss the possibility that the performance increments generated by firm level collaborative activity accrue to the population and not directly to the firm. In the early stages of collaborative activity within an industry, firm behaviour may be closely linked to firm performance (Dollinger and Golden 1992). However, over time, as more firms collaborate, the gains at the firm level must eventually diminish because there are "fewer 'others' to gain from" (Dollinger and Golden 1992, p.710). Once knowledge of any generalised benefits to collaboration pervade the industry, firms will actively seek out collaboration, and thereby dissipating any gains made by firms that collaborated earlier. Further increases in performance may only be visible at the population level. When all firms in a population participate in collaborative strategy, they will not outperform each other (ceteris paribus) as a function of being part of the agglomerate, but the industry may outperform other, less cooperative industries (Dollinger

1990). In such instances, the focus of investigation would then shift to examining the type and content of the existing collaborative relationships to see if performance differed across these different forms of relationships. If this is the case, then the existence and magnitude of any performance differentials between collaborating and non-collaborating firms will depend on how pervasive collaboration is within an industry. It is expected that performance benefits would be stronger for collaborating firms where industry-level collaboration is low.

Hypothesis 7: The lower industry-level collaborative activity, the greater the extent to which collaborating firms outperform those that use either market or internal approaches.

Strategic Orientation

The strategic orientation of a firm has been defined as the relative emphasis an organisation places in understanding and managing the environmental forces acting on it (Voss and Voss 2000). Strategic orientation is a multidimensional construct that refers to three distinct orientations: customer, competitor, and technology (Gatignon and Xuereb 1997). Research in marketing provides strong support for a positive relationship between the strategic orientation of a firm (customer orientation, competitor orientation, and product/technological orientation) and performance (for a recent review, see Voss and Voss 2000). While the moderating impact of strategic orientation with collaboration is discussed below, to be complete, I follow the literature and include the following hypotheses:

Hypothesis 8: Firm performance will have a positive association with (a) customer orientation, (b) competitor orientation, and (c) technological orientation.

Collaborative Orientation

A collaborative-oriented firm can be defined as a firm where the managers are open to the mindset of cooperation and believe in the potential benefits of collaborating. Other firms are seen as valuable sources of information and resources that can augment a firm's own

capabilities. These firms have the ability and will to engage in collaboration when they believe there is merit in doing so. Moreover, collaborative-oriented firms see the long-term value of being involved in relationships with other firms, rather than simply the short-term benefits that can be derived through such relationships. Firms with a high collaborative orientation are more likely to obtain information, business and have stronger relationships with other firms in an industry than those firms that have a low collaborative orientation (Human and Proven 1997). For firms involved in collaborative relationships, a high collaborative orientation should mean that a firm is more committed to the relationship, thereby increasing the likelihood that the relationship is beneficial. Conversely, firms with managers who have a low collaborative orientation that are also collaborating are likely to benefit less from the relationship, simply given that their commitment to collaboration as a viable and beneficial organisational form is lacking. A committed individual or management team is more likely to accept the goals and values of collaboration, express genuine interest in its welfare, expend considerable effort on its behalf, and desire to remain a member than firms that have low levels of commitment to an organisational form such as collaborative relationships (Kelly and Davis 1994), thereby improving the ability of the firm to achieve positive outcomes.

> *Hypothesis 9: Collaborative Orientation acts as a quasi moderator, exerting (a) a direct, positive effect on firm performance and (b) a positive, moderating effect on the relationship between collaboration and firm performance.*

Type of Collaboration

The previous discussion developed hypotheses comparing performance between collaborating and independent firms (including both firms that remain independent by choice and those who do so because they are constrained). This section develops hypotheses at a more fine-grained level, investigating the performance implications of various types of collaboration (see Figure 2).

For the more fine-grained analysis, I distinguish between development-oriented, marketing-oriented relationships, and other forms of interfirm collaboration. Development and marketing activities are often carried out separately and this distinction allows an

exploration of any differential impact each type of agreement might have. The distinction between development and marketing-oriented classes of agreements is consistent with Hagedoorn (1993), who found the two classes to be the most commonly employed interfirm collaborative links (see also Mitchell and Singh 1996). The primary forms of other interfirm relationships are licensing agreements and agreements where managers were unable to classify the relationship as either a marketing, development or combined (marketing and development) form of collaboration. As Mitchell and Singh discuss, licensing raises conflicting issues concerning firm performance. Licensing technology to other firms might be associated with commercialisation weakness, and, therefore, be associated with lower levels of performance. For firms involved in collaborative agreements where the focus of the relationship is unclear, they are less likely to be in a position to derive the potential benefits of collaborating than firms who have established the goals and scope of their collaborative relationship (Hamel 1991).

Hypothesis 10: (a) Marketing-oriented collaboration, (b) development-oriented collaboration, and (c) combined marketing- and development-oriented collaboration will outperform other forms of interfirm collaboration.

Type of Collaboration and Strategic Orientation

Customer orientation can be defined as "the set of beliefs that puts the customer interest first" (Deshpande, Farley, and Webster 1993, as cited in Voss and Voss 2000). A customer-oriented firm has the ability and will to identify, analyse, understand, and answer user needs (Gatignon and Xuereb 1997). By entering joint marketing arrangements or other collaborative marketing agreements, the firm can capitalise on its highly customer-oriented position, or seek to further its level of understanding of customers through learning from the other firm (Hamel et al. 1989). McGee et al. (1995) found some evidence of a positive relationship between the use of cooperative marketing agreements by firms whose primary competitive strategy was marketing differentiation. Similarly, a technology-oriented firm can be defined as a firm with the ability and will to acquire a substantial technological background and use it in the development of new products (Gatignon and Xuereb 1997). Collaborative arrangements that include research and development are one such method for acquiring a greater competency in technology. Moreover, such activities may allow the firm to leverage its technical abilities beyond the

constraints of its own firm resources. Strategic alliances can be used to develop and sustain technological leadership. Therefore, technology-related collaborative arrangements will provide highly technology-oriented firms with a mechanism for maintaining their competitive position.

Hypothesis 11: Customer Orientation will have a positive, moderating effect on the relationship between marketing-oriented collaboration and performance.

Hypothesis 12: Technological Orientation will have a positive, moderating effect on the relationship between development-oriented collaboration and performance.

Methodology

Sampling Frame and Data Collection

A two-stage survey design, conducted two years apart, was used to collect the data for my thesis. The initial data for this analysis came from a database of collaborative business relationships in New Zealand, compiled in 1997 by Dr Mary Ellen Gordon, Department of Management, University of Canterbury. The database includes information on domestic and international collaborative relationships involving New Zealand firms that are employers of 10 or more people. Two waves of questionnaires mailed to New Zealand firms, and information gathered through secondary sources including newspapers, business magazines and The New Zealand Business *Who's Who* (39th ed.) provided information on 1612 firms. The minimum-number-of-employees requirement (at least 10 employees) was enforced primarily to allow a manageable database. The second stage of data collection comprised a questionnaire sent out to firms by mail in the latter half of 1999. The database of 1612 firms developed from the first-stage data collection provided an initial sampling frame for this follow-up survey.

The sampling frame of 1612 firms was split into two subgroups: firms that were actively involved in collaborative arrangements at the time of the first-stage data collection and those that had remained independent. For the subgroup of firms involved in collaborative

relationships, I was able to distinguish between three types of interfirm agreements: joint ventures, contractual collaborations, and informal agreements. *Contractual collaborations are defined as non-equity formal agreements between two or more firms, including technical buybacks, licenses, strategic alliances, and management and service agreements.* Informal agreements are non-contractual cooperative associations between two or more firms. Collaborative relationships that were defined as either joint ventures or informal agreements were omitted from the sampling frame. The characteristics of free-standing joint ventures differ significantly from those of collaborative relationships and sufficiently approximate the characteristics of businesses that operate independently to justify there omission (Kay 1992; Williamson 1991a). Informal agreements were excluded to avoid *ad hoc* verbal agreements that were likely to be less important to the firm. Ruling out these two types of collaborative activity also minimised the heterogeneity in the sample of collaborating firms.

Firms involved in contractual collaborations were selected from the sampling frame based on the following criteria. First, the firm must have formally instituted any contractual agreements between 1995 and 1997. This restriction was imposed so that I could adequately control for prior firm performance. Controlling for prior performance without this restriction is problematic because the dates that firms entered into collaborative relationships spanned many years (earliest 1936, most recent, 1997). In any particular sector, in any given year, shocks or other external factors (e.g., economic conditions or deregulation) may have affected the performance of firms. Thus, unless the timeframe studied for the institution of collaborative agreements is restricted to a relatively small number of years, the use of firm performance in the year preceding collaboration may be an ineffective control variable due to the possibility of temporal effects impacting the reported prior performance data of these firms. The sample was therefore restricted to firms that had formally instituted agreements between 1995 and 1997. This restriction enabled me to control for prior performance by collecting performance data for a single year, 1994 - the last year before the window of collaboration. Controlling for prior performance would rule out the possibility that any observed associations between collaboration and performance were due to the performance of firms prior to entering collaborative relationships.

Second, at the time of the first-stage data collection, firms must not have been actively involved in any interfirm relationships formed prior to 1995. This restriction was imposed so that, ceteris paribus, all firms at the beginning of the study period were the same (i.e., all firms were not collaborating), since I wanted to investigate the relative impact of collaboration on future performance.

From the sampling frame of 1612 firms, 121 private sector firms were identified that met the aforementioned criteria. Random samples of 200 non-collaborating firms were then drawn from the same sampling frame until the sample of independent firms had no significant differences with the collaborating sample in terms of firm age, size (number of employees) and sales (1996 consolidated sales) - all measures collected during stage one.

Developing and Pre-testing the Instrument

To carry out the study, I selected items from existing scales for measuring environmental (market turbulence, technological turbulence) and strategic orientation constructs (competitor, customer, and technological orientation). Unfortunately, adequate measures for complexity[5], degree of internationalisation and industry-level collaboration were not available in the literature, while collaborative orientation was a new construct. After examining relevant literature and determining the content of the constructs I was trying to capture, scale items were developed for each of the proposed variables. Due to time and financial constraints a full-blown pre-test to establish the appropriateness of individual items and the reliability and validity of the proposed measures, was infeasible. Discussion of the results of the main study's factor analysis and item refinement for these measures is left until the Variables and Measures Section. However, prior to pre-testing in the field, several lecturers in The Department of Management, University of Canterbury, read over the items to be used to establish the face validity of the items. The questionnaire was also checked, with advice given for changes in the variables being used and improvements in the general layout of the questionnaire.

Two revised questionnaires were developed for pre-testing in the field: one for collaborating firms and one for independent firms. Both questionnaires had the same

[5] This construct was initially included in the study, however, questionnaire length precluded its inclusion.

sections designed to measure the firm's environment, strategic orientation, extent of internationalisation, and performance. The questionnaire designed for collaborating firms also had a section related to these firms' collaborative agreements, the purpose of which was to identify whether or not these agreements were still active. The questionnaire sent out to non-collaborators had a section that asked managers of these firms why they had not been involved in any collaborative activity back in 1997, as well as asking whether they had subsequently entered any collaborative agreements.

Collaborating and independent firms were selected from the sampling frame for a pre-test of the instruments. For collaborating firms, this group included those firms that had failed on one or both of the criteria required to be involved in the main study. Independent firms used in the pre-test were selected from those firms not chosen for the main study. These firms were contacted by telephone to notify prospective respondents about the survey and to solicit participation. Once participation had been granted, the questionnaires were mailed, faxed or e-mailed to respondents along with a cover letter explaining the purpose of the survey. Respondents were asked to comment on anything they did not understand or think relevant (e.g., items for scale measures) and make note of the time required to fill in the questionnaire. For each group, five to ten managers either returned a completed pre-test with comments or discussed any issues they had with the instrument by phone, fax or e-mail. The main issue raised was the length of time taken to fill out the questionnaire: this ranged between 20 to 33 minutes. Respondents indicated that they thought this was too long and would likely reduce the number of managers who would return the completed questionnaire. A revised questionnaire was developed, which removed items that were to have been used for an environmental 'complexity scale'. The format of the questionnaire was also changed to give it a less daunting appearance. However, due to the nature of the survey, the questionnaire could not be considerably shortened, resulting in a questionnaire that took between 15 to 25 minutes to complete.

The Main Study

In October 1999, I mailed the second-stage questionnaires to the 321 selected firms. The final questionnaire sent out to collaborating firms differed slightly from the one that was sent to non-collaborating firms (see Appendices 1A and 1B). For those firms involved in collaboration, I identified the manager who was actively involved in the collaborative

relationship from the names given on the returned questionnaires from the first-stage data collection. For those firms where the specified manager was no longer involved, the questionnaire was redirected to another senior person within the firm. Similarly, for firms that had remained independent at the time of the initial data collection, the questionnaire was sent to a senior manager of the firm. Respondents were invariable the CEO, managing director or general manager of the firm. Given the strategic and sensitive nature of the information provided in the survey responses, it was believed that persons in such high level positions would have the greatest knowledge and expertise to respond accurately. By definition, an informant's role is to report on organisational processes, events, or outcomes that are aggregate in nature, and thus informants should be sampled according to expertise (McKendall and Wagner 1997).

I attempted to enhance the response rate using several methods. First, the questionnaires were sent out accompanied by a personalised cover letter that thanked respondents for their firm's participation in the previous data collection stage, introduced the nature of the follow-up study, its potential value, and the importance of the manager's participation. Second, a summary of the survey results and conclusions was offered to respondents as an incentive to participate. Finally, nonrespondents were contacted with two follow-up reminders, two weeks apart, and a personal telephone call. Throughout the process, I assured participating managers of confidentiality.

Of the 321 questionnaires initially mailed, a total of 40 were returned marked "moved/not forwardable," "person no longer at company," or "business no longer in operation." This reduced the actual sampling frame to 281 firms (108 collaborating firms and 173 independent firms). Of these 281 firms, a total of 112 firms ultimately returned the questionnaire (40% effective response rate or 35% response rate for the initial sampling frame). It is important to note that such a response rate is good when considering that the targeted respondents were high-level people (e.g., owners, managing directors), often under significant time constraints, and that the strategic focus of the survey would result in responses often considered sensitive and confidential. Both these factors would produce a downward bias to the response rate. In terms of each group, I received 50 questionnaires from collaborating firms (46% effective response rate, 41% overall response rate) and 62 non-collaborating firms (36% and 31%, respectively). The lower response rate for non-

collaborating firms may have been due to both questionnaires being entitled 'Collaborative Business Relationships', which perhaps resulted in firms not involved in such relationships feeling it was inappropriate for them to answer the questionnaire. However, the larger sampling frame (200 versus 121) for this group resulted in a similar final sample size for both independent and collaborating firms, 62 and 50, respectively. The final samples for the collaborating and independent firms did not differ in terms of firm size (number of employees), sales (1996 consolidated), or firm age. Incomplete responses, particularly for the performance sections, meant that the final sample size for the analyses ranged between 89 and 93 firms (depending on the performance measure used). Tests comparing firm size (number of employees), sales and firm age of the 112 firms that replied with the 169 firms that did not return questionnaires indicated that nonresponse bias was not a concern.

The collaboration data collected using the aforementioned method has one major advantage over other alliance studies; it includes information regarding the termination of agreements (c.f., Gulati 1995; Hagedoorn 1993; Mitchell and Singh 1996). As Mitchell and Singh (1996) discuss, one of the limitations of much alliance research has been the inability to get data on agreement terminations. This has meant that these studies have usually measured the establishment rather than the current existence of collaborative activity (Gulati 1995; Mitchell and Singh 1996). My data, however, captured the cessation of cooperation between the two stages of data collection (October 1997 to October 1999), enabling a comparison of the performance outcomes associated with short-term collaboration versus ongoing collaboration.

One limitation of my data collection procedure was that I was unable to control for the quality of collaboration, which should directly influence the performance level of the firm. A well-executed collaborative agreement will have a more favourable impact on performance than an ineffective one. However, the large number of collaborations limits adverse consequences, because the data represent a broad range of collaboration quality.

Variables and Measures

Appendix 3 provides the factor analysis results, Table A6 the construct reliabilities, and Appendices 1A and 1B the response format employed in the questionnaire, for the measurement items used in this study. Table A1 contains the mean and standard deviation

for each variable used in the study, while Table A2 provides the correlations among the key indices and constructs.

Collaborative Relationship Variables

Investigating the effects of collaboration at the first-level of analysis simply required a single 0-1 dummy variable that indicated whether the business had any contractual collaborations in 1997 that had been established between January 1995 and October 1997. 50 collaborating firms and 62 independent firms were used in the analysis. None of the collaborating firms in the final sample had more than one active contractual agreement and therefore there was no need to control for the number of collaborations in which a firm was involved.

Type of Collaborative Relationships. For the more fine-grained analysis, I distinguished between development-oriented and marketing-oriented relationships because the two categories of activities are often carried out separately and it also enabled an exploration of the potential differential impact of each type of agreement. The distinction between development and marketing-oriented classes of agreements is consistent with Hagedoorn (1993), who found the two classes to be the most commonly employed interfirm collaborative links. In the first-stage questionnaire (see Appendix 2), respondents were asked to indicate all activities involved in the relationship by both their firm and other firms in the agreement. The six activities included were R&D, manufacturing, marketing, distribution, sales, and after-sales-service. Firms that indicated that either they or their partners were involved in marketing, distribution, sales, and after-sales-service were collapsed to form *marketing-oriented relationships.* Firms that indicated that either their partner firm (in-licensing of products or components) or both firms (joint R&D) were involved in R&D were used to form *development-oriented relationships.* A third variable *other interfirm relationships* was formed to represent firms where the partner firm was manufacturing and where the respondent firm was involved in R&D (manufacturing or out-licensing), and agreements for which I could not identify a primary purpose. When required, descriptions of the agreements given by respondents were also used to help classify cases into the most appropriate category.

1. *Development-oriented relationships* (12 cases): In-licensing of products or components from other business; technology agreements (e.g., joint R&D; development of product interfaces or product compatibility).

2. *Marketing-oriented relationships* (37): Marketing or distribution agreements (e.g., marketing or distribution by one firm of partner's product).

3. *Other interfirm relationships* (11 cases): Out-licensing relationships (3 cases), manufacturing agreements (2 cases), and agreements that could not be classified among the above categories (6 cases).[6]

Initially, three nonexclusive 0-1 dummy variables were developed that recorded whether the firm had entered any development-oriented, marketing-oriented, or other collaborative agreements at the time of the first-stage data collection. However, further investigation of the 12 firms involved in development-oriented relationships showed that 10 of these firms were also involved in marketing agreements, leaving only 2 firms that were involved exclusively in development-oriented relationships. Given the small number of development-only relationships, cases were recoded into three mutually exclusive variables: 'marketing-only' (27 cases) 'both types' (10 cases of marketing and development oriented relationships), along with the 'other' category, which remained the same (11 cases). The two firms involved only in development-oriented activities were excluded from further analysis, resulting in 48 usable cases of collaboration.

Reason for Not Collaborating. The questionnaire sent out to non-collaborating firms asked respondents to indicate why their firm had not been involved in any collaborative agreements back in October 1997 (see Appendix 1B). Respondents were asked to tick any statements that applied to their firm's reasons for not collaborating. The statements in this list can be classified into four groups: (1) company policy not to collaborate (statements 1, 3, and 8), (2) perceived limited benefits for collaborating (statements 2, 5, and 7), (3) unable to do so (statements 4, 9a, and 9b), and (4) legal implications (statement 6). Based on these four groups, firms were classified as either remaining independent by choice

[6] The number of cases does not add up to 50 because some firms were involve in more than one type of collaborative relationship.

(groups (1) and (2)) or because of their inability to enter a collaborative agreement (groups (3) and (4)). A 0-1 dummy variable was developed to indicate whether the firm could not collaborate.

Moderator Variables

Environmental Measures. In accordance with my desire to study the moderating effects of environmental factors (market turbulence, technological turbulence, and environmental complexity) on the collaboration-performance link, I used an environmental perception scale that used items developed by several authors. This scale comprises three items drawn from Miller and Friesen's (1982) environmental dynamism measures, four items from Jaworski and Kohli's (1993) technological turbulence scale, two items from the same authors (1993) market turbulence scale, one item from Han, Kim, and Srivastava's (1998) market turbulence scale, and three items from Dickson and Weaver's (1997) environmental perception scale. One item developed for the complexity scale was retained in the scale after the pre-test revisions had been made. Scale items focus on behaviour, assessing environmental perceptions relating to the extent of environmental turbulence pertaining to both customers and technology. Two additional scales were added, one assessing perceptions of the extent to which internationalisation seemed necessary for firm success and a scale addressing perceptions of the extent of collaboration in the firm's principal industry. The demand for internationalisation scale comprised six items, two of which were adapted from Dickson and Weaver (1997). The industry-level scale consisted of 5 items developed for this study. All items had a seven-point Likert response scale ranging from 1 (strongly disagree) through 7 (strongly agree).

The 25 environmental items were factor analysed using principal axis analysis, with final factor loadings determined via varimax rotation. Table A3 presents descriptions of the factor analysis results, while Table A6 displays the coefficient alphas for each of the environmental scales. The final solution had the environmental items loading on four factors, consistent with the four proposed scales. The measure for each environmental component was derived by developing a summated scale of the items listed under each component. The summated scales were divided by the number of items included in each component, yielding scales with a range of 1 to 7. The alpha coefficient for market turbulence (.53) was well below the threshold of .70 recommended by Nunnally (1978) for

the test of scale reliability, and it was therefore not used in subsequent hypothesis testing. All other scales indicated acceptable levels of reliability.

Strategic Orientation

To measure strategic orientation I used multiple-item scales drawn primarily from the market orientation literature. As with the environmental scale items, these items were factor analysed using principal axis analysis with varimax rotation. The final measure for each strategic orientation component was then derived in the same manner as the environmental measures. Table A4 presents the factor analysis results and Table A4 the coefficient alphas for each of the scales.

Customer and Competitor Orientation. To assess these constructs, I used the scale items (six items for customer orientation, four items for competitor orientation) developed by Narver and Slater (1990), with minor rewording made to two of the items. As the Appendix depicts, however, the factor analysis of the strategic orientation variables did not extract a factor for competitor orientation. The alpha coefficient for customer orientation (.83) surpassed the .70 threshold recommended by Nunnally (1978) for the test of scale reliability.

Technological Orientation. The measure for technological orientation is based on items developed by Gatignon and Xuereb (1997). This measure includes six items that represent the use of sophisticated technologies in new product development, the rapidity of integration of new technologies, and proclivity toward developing new technologies and generating new product ideas. As with Gatignon and Xuereb's factor analysis loadings, technological orientation loaded on two factors. These two scales were combined to form the variable technological orientation. Scale reliability for this measure was .79. Customer and technological orientations are not assumed to be independent. As Table A2 shows, customer orientation is positively correlated (ρ=.41, p=.00) with technological orientation.

Collaborative Orientation. As discussed previously, the collaboration scale items were developed specifically for this study. Eight items were used to try and capture the construct defined as collaborative orientation. This scale included three items assessing

the perceived benefits of collaborating: 'collaborating with other firms provides a mechanism for developing mutually advantageous benefits,' 'by working together, firms in our industry can make the industry more profitable for everyone involved,' and 'cooperating with other firms provides a mechanism for improving a firm's capabilities.' Two items were used to capture whether managers perceived other firms as constraining or complementing their activities: 'competitors can be used to enhance a firm's capabilities' and 'other firms in our industry are important sources of information and resources for our firm.' The other three items assessed the perceived risk, temporal nature of collaborating (for short-term versus long-term gain), and belief that, if everyone else is doing it, it must be the right thing to do attitude.

Factor analysis did not yield a clean result for this measure (see Table A4). The final measure retained 5 items and had an acceptable alpha coefficient of .82, however, it did not capture the richness initially envisioned for this construct. Indeed, the final scale for collaborative orientation can best be described as the perceived benefits to collaborating, capturing a more narrow amount of the construct than initially defined. Further measure development and validation could result in a more meaningful measure of this construct.

Controls

Prior Performance. I wanted to include prior performance in the model to address the possibility that the financial position of a business determines whether it uses collaborative relationships, in which case any observed associations between collaboration and performance would stem from the firm's prior strength (or weakness) rather than from the collaboration. To maintain consistency across the sample, I used 1994 (i.e., the last financial year prior to the window of time open to collaborate, 1995-1997) as the base period for performance. Pretesting had indicated that perceptual measures of performance would not be adequate given the length of time that had passed (just under four and a half years) since the end of the 1994 financial year. Instead, measures of 1994 Gross Sales and 1994 Net Income after Taxes (also to be used for the change in performance measures) were to serve the purpose of controlling for prior performance. Unfortunately, the low response for these two measures of performance inhibited the inclusion of prior performance in the model. The implications of this limitation are left to the Discussion Section.

Sector. The first-stage questionnaire asked respondents were asked to indicate what their company's core business was. Using secondary sources (Australian and New Zealand SIC (1993 ed.) and The New Zealand Business *Who's Who* (39th ed.)), I categorised each firm into a specific sector. Given the small sample size, I had to maintain a balance between developing more homogeneous subsets of firm without significantly reducing the degrees of freedom for the model by including too many different codes. Firms were broadly categorised as being in manufacturing (40 firms, SIC Division C), transport and storage (9 firms, Division I, Subdivision 61), wholesale and retail trade (17 firms, Divisions F and B) or property and business services (42 firms, Division L, Subdivisions 77 and 78).

Firm Size. Firm assets, sales, and number of employees are the variables most often used as size indicators (Dickson and Weaver 1997). For the purposes of this study, firm size was measured using a categorical variable for the number of reported employees. Firms were categorised into one of five groups: 1-10, 11-20, 21-50, 51-99, or 100+ employees.[7]

Firm Age. The data from stage one included the year the company was founded. Firm age was calculated by subtracting this date from 1999, the year of the second stage data collection.

Measures of Firm Performance

Following the work of Venkatraman and Ramanujam (1986), performance was viewed as a multidimensional construct. Accordingly, multiple models of performance were used in this study. The first measure of performance used in this study was based on those used by Gupta and Govindarajan (1984) and Covin and Slevin (1989). The respondents were first asked to indicate on a 7-point Likert-type scale, ranging from 'less important to us' to 'more important to us,' the degree of importance their firm attaches to each of the following performance criteria: sales growth rate, return on investment, product/service changes, cash flow, new product/service development, gross profit margin, net profit from operations, success of new products/services, level of sales revenue, diversification into new products/markets, and relative market share. To minimise the potential impact of

[7] While the initial sampling frame of firms for the first-stage data collection was restricted to firms thought to have a minimum of 10 employees, the final database had a sizeable proportion of firms in the 1-10 category.

individual bias, these 'importance' scores were mathematically adjusted to sum to 1. The respondents were then asked to indicate on another seven-point Likert-type scale, ranging from 'much worse than the competition' to 'much better than the competition,' their belief about the performance of their firm on these same performance criteria. These performance scores were then multiplied by the importance scores to compute a weighted average performance index for each firm, with a range of 1-7. This measure was labelled the firms' 'overall performance score'.

The second set of performance measures was based on the method used by Hart and Banbury (1994). They postulated five performance dimensions: Current Profitability, Growth/Share, Future Positioning, Quality, and Social Responsiveness, with items developed to reflect each of these dimensions. The items reflecting the three dimensions: Current Profitability, Growth/Share, and Future Positioning were incorporated into this study. Additional items were included to flesh out each dimension. This measure utilised the same response format used to develop the performance scores discussed above. The set of perceptual measures was then factor analysed using principal axis analysis with varimax rotation (see Table A5). Confirmatory factor analysis was used based on the belief that three unique dimensions should be present in the data. The resultant dimensions were: (1) growth/share (level of sales revenue, sales growth 1994-1998, and relative market share); (2) profit performance (Return on Investment, cash flow, gross profit margin, and net profit from operations); and (3) future position (product service changes, new product/service development, success of new products/services, and diversification into new products/markets). As with the previous scales developed from factor analysis, summated scales were formed and then divided by the number of item in each dimension, resulting in scales with a response range of 1-7. All three scales had more than acceptable alpha reliability coefficients. Table A6 displays the means, standard reliability coefficients for each of these scales.

There were several reasons for primarily using subjective measures of performance. The problems relevant to performance measurement in the context of small firms are well documented by Sapienza, Smith, and Gannon (1988). First, small firms are "notorious for their inability and unwillingness to provide desired information" to researchers (Fiorito and LaForge 1986, p.110). Thus, more complete financial information can often be

obtained with a subjective measure. Furthermore, objective financial data on most of the sampled firms was not publicly available, making it impossible to check the accuracy of any self-reported financial performance figures. Second, assuming that accurate financial data were reported, such data on small firms are difficult to interpret. Cooper (1979, p.326), for example, noted that "operating losses or low profits in small, growth-oriented firms may not be indicative of poor management if the reason for this apparent poor performance is heavy investment in product and market development." Moreover, often when such data are made available they are not representative of the firm's actual performance, as many owners for a variety of reasons report manipulated performance outcomes. Third, absolute scores on financial performance criteria are affected by industry-related factors (Miller and Toulouse 1986). As such, directly comparing the objective financial data obtained for small firms in different industries would be misleading. With most of the firms in the sample privately held and no external source of information concerning their performance available, I relied primarily on the perceptual measures.

However, given the need for valid performance measures, and the difficulty in collecting valid data, multiple measures of performance are recommended. The employment of multiple measures of performance, particularly when there is reason to question the validity of a single measurement method, serves corroboration purposes and permits the assessment of inter-method reliability (Govindarajan 1988). For this reason, both objective (self-reported) and subjective measures of performance were collected for the study.

At the end of the survey instrument each respondent was asked to provide objective measures of performance for 1998 Return on Investment and actual gross sales (domestic and export) and net income after taxes for the beginning (1994 financial year) and ending (1998 financial year) years of the 4-year period under study. These financial figures for the performance variables are self-reported by respondents in a profit and loss statement, but not perceptual. Thirty-two firms provided most or all of this information, reconfirming that small firms are generally unwilling to give out objective financial data. To measure change in performance, I calculated a 4-year compounded annual rate of sales growth and net income growth for each firm. The following formula was used: average sales growth =

$[(Sales_{1998}/Sales_{1994})^{1/4} - 1)*100]$. Substituting net income into the same formula, I calculated net income growth. Finally, Return on Sales was calculated as net income after taxes / total gross sales, where total gross sales equalled domestic gross sales + export gross sales.

Although there is always some doubt cast upon self-reported 'objective' and perceptual indicators of performance there is evidence of a high correlation between perceptual and objective measures at the firm level. Recent research has shown that subjective assessments of business performance obtained from senior managers correlate strongly with objective financial performance measures (e.g., Dess and Robinson 1984; Hart and Burnbury 1994; Naman and Slevin 1993; Pearce, Robbins, and Robinson 1987; Venkatraman and Ramanujam 1986, 1987). Venkatraman and Ramanujam (1987) found a strong positive correlation between managerial perceptions of performance and secondary data. For privately-held firms and corporate business units where there is no public data available, Dess and Robinson (1984) also found a strong correlation between perceptual data and financial (self-reported) performance measures.

Following the work of these researchers a validation procedure was used to examine the convergent validity of my measures; the responses of the approximately 30 firms that provided objective measures were correlated with their responses on the subjective measurement scales. As, Table A7 illustrates, all four subjective measures were strongly correlated with average net income growth (pearson correlations ranged from .46 to .63, significant at the .01 level or higher), while the overall performance score, profit performance and future position were correlated with 1998 return on investment, offering support for the validity of the subjective measurement technique as a substitute for 'objective data' data. Given the general convergence in measures and supporting research, the use of the subjective measures of performance was deemed appropriate for the purposes of this study.

Analyses

Model Specification

To test my hypotheses, I conducted a series of regression analyses that substituted the four performance measures as dependent variables. For each performance measure, I conducted a hierarchical, moderated regression analysis as the hypotheses suggested that the relationships between individual variables and firm performance were moderated by additional independent variables. A number of authors (e.g., Schoonhoven 1981; Darrow and Kahl 1982; Covin and Slevin 1989) advocate the use of moderated regression analysis when investigating contingency relationships since it allows interaction terms, which are implied in all contingency relationships, to be explicitly examined. According to Arnold (1982), moderated regression provides the most straightforward and the most general method for testing contingency hypotheses in which an interaction is implied. Moderated regression is generally regarded as a conservative method for identifying interaction effects since the interaction terms are not tested for significance until the main effect independent variables are first entered into the equation (Cohen and Cohen 1983). Hence, the interaction effects are found to be significant only if it adds to the main effect regression model's explanatory ability (Covin and Slevin 1989). Finally, partial *F*-tests for increments in R^2 for cross-product terms are valid even when the terms are correlated, thus minimising the effects of serious multicollinearity (Cohen and Cohen 1983). The basic form of the regression equations (hereafter referred to as models) for the two levels of analysis were:

First level of analysis (Models 1a-1d):

$$Y_{1998} = \beta_0 + \beta_1 TT + \beta_2 DI + \beta_3 IC + \beta_4 CU + \beta_5 CO + \beta_6 TO + \beta_7 C_t + \beta_8 CC_{1997} + \beta_9 C_t \times TT + \beta_{10} C_t \times DI + \beta_{11} C_t \times IC + \beta_{12} C_t \times CU + \beta_{13} C_t \times CO + \beta_{14} C_t \times TO + \varepsilon$$

Second level of analysis (Models 2a-2d).[8]

$$Y_{1998} = \beta_0 + \beta_1 TT + \beta_2 DI + \beta_3 IC + \beta_4 CU + \beta_5 CO + \beta_6 TO + \beta_7 MC_t + \beta_8 OC_t + \beta_9 DMC_t + \beta_{10} CC_{1997} + \beta_{11} MC_t \times CU + \beta_{12} DMC_t \times TO + \varepsilon$$

where

Y_{1998} = performance measure

β_0 = intercept

TT = technological turbulence

DI = degree of internationalisation

IC = industry-level collaboration

CU = customer orientation

CO = collaborative orientation

TO = technological orientation

CC = can't collaborate

C_t = collaborate (where, t = 1995, 1996, or 1997)

MC_t = marketing only collaboration (where, t = 1995, 1996, or 1997)

OC_t = other interfirm collaboration (where, t = 1995, 1996, or 1997)

DMC_t = combined development and marketing collaboration (where, t = 1995, 1996, or 1997)

For both levels of analysis, the base-case (or control group) is the group of firms who 'choose not to collaborate'.

A Note on Model Specification

The performance measures for the specified model can be substituted, which allows me to take advantage of the strengths of each type of performance measure while also enabling me to try and answer two slightly different questions:

1. Do collaborating firms have higher performance levels than independent firms?

[8] Note that the model specifies DMC (combined development and marketing collaboration) for the interaction with technological orientation (TO). DMC was used to test H_{12} because of the insufficient number of development-only collaborations (refer to discussion in Variables and Measures Section).

2. Does collaboration *improve* firm performance?

Specifying current performance as the dependent variable allows Hypothesis 1, collaborating firms outperform (or have higher performance than) independent firms, to be tested. Using change in performance as the dependent variable ($\Delta Y = [(perf_{1998}/perf_{1994})^{1/4} - 1)*100]$), allows for Hypothesis 2, collaboration improves firm performance, to be tested. Unfortunately, as mentioned in the Variables and Measures Section, the low response rate for the measures required to calculate change in performance meant that this hypothesis could not be tested.

The models also address causality. As shown in both models (1a-1d) and (2a-2d), the structural parameters capturing the effects of collaboration represent the effects of *prior* collaborative activities on *current* performance. This lag structure is meant only to convey the importance of temporal sequencing of the data. I choose not to specify a contemporaneous relationship (i.e., that firms expect current period revenue returns to collaborative activity) to avoid potential reverse causality interpretations of the collaboration-performance relationship. However, while the temporal sequencing of events is a necessary condition for establishing causality, it is not sufficient. Again, due to insufficient performance data for 1994, I was unable to control for any effects resulting from the firm's prior performance.

Hierarchical regression was used to build the models in four steps: environment (TT, DI, IC), strategic orientation (CU, CO, TO), collaboration (C, CC for Model 1c, MC, OC, DMC, CC for Model 2c), and then the interactions. The *F*-test was used to investigate the significance of the each of these four sets before individual *t*-tests were conducted on the independent variables that made up each set, thereby reducing the likelihood of large set-wise Type 1 error rates (Cohen and Cohen 1983).

Model Estimation

Pooling of the Collaborating firms. Investigation of the set of hypotheses relating to the first level of analysis (Models 1a-1d) required comparing firms that were involved in collaborative relationships with firms using independent methods. Thus, prior to developing the proposed models, the performance of the firms in the collaborating group

was compared on two relevant dimensions to see if it was appropriate for collaborating firms to be pooled. The first dimension was whether or not firms that had been involved in collaboration in 1997 had subsequently terminated their relationships. The maximum time a firm in this sample could have been involved in a collaborative agreement was four years and eight months - if it had entered an agreement in January 1995 and terminated in September 1999. It would be expected that for firms that terminated their agreements quickly, these relationships may not have provided the desired benefits and as such would have had a limited impact on the performance of these firms. Independent sample *t*-tests were conducted for the four performance measures to compare the performance of firms who continued to hold their collaborative agreements of 1997 with those firms that had subsequently terminated any collaborative agreements held in 1997. Although firms that had terminated their collaborative agreements consistently had lower performance on all dimensions, there were no significant differences (at the 0.05 level) between these two groups, allowing these two subgroups to be pooled. The effect of including firms whose collaborative agreements had dissolved in the analysis is conservative relative to the hypothesised relationship; if in fact most alliances are terminated quickly, they could not have provided the desired benefits and would have limited positive effects on performance, thereby providing less support for H_1.

The second dimension used to compare the performance of firms that collaborated was the year they entered into an agreement. Two reasons can be suggested as to why the year the collaboration was formally established might impact performance. The first is that firms who entered into agreements in an earlier year had more time for the relationship to develop and provide tangible outcomes. The second is that there might have been factors specific to the environment in a certain year that made collaborating more valuable to a firm. ANOVA was conducted to test for differences in firm performance across the three years firms entered collaborative agreements (1995, 1996, or 1997). No significant differences across 'year entered collaboration' were found for any of the performance measures. Thus, the sample of collaborating firms was pooled and used in subsequent analysis to compare the effects of collaborating against firms that remained independent.

Control Variables. The specified model included firm age, firm size, and industry as control variables. Due to the lower than desired sample size, it was necessary to reduce

the number of independent variables in the model to allow for an acceptable ratio of cases to variables (approximately 10:1). Thus, the control variables were tested to identify if any performance differences existed across these variables. ANOVA was performed on the sample to detect performance differences across the four broad industries. No significant differences were detected and therefore industry was not included in the model. The initial regression analysis included firm age as a control variable, however, it was not found to be significant. As Table A2 depicts, firm age was correlated with both Customer Orientation (ρ= -.26, p=.01) and Technological Orientation (ρ= -.24, p=.03). However, analyses that were conducted including firm age did not influence the direction or significance level of the beta coefficients of these two variables nor those of the remaining variables, and thus firm age was removed from further analysis. The final control variable was firm size (number of employees); this variable had no effect on performance score, profit performance or future position, however, it did have a significant effect on growth/share performance when a contrast was made between firms with 1-10 employees and firms with more than 10 employees. Growth/share performance for firms with 1-10 employees was lower than it was for firms with 10 or more employees (p<.05). This is not surprising, given that the items making up the growth/share measure include level of sales revenue and relative market share: by their very nature, small firms are likely to have lower sales and market share compared with their larger competitors. However, the coefficients of the other independent variables in the regression models did not differ significantly across the equation that included a dummy variable representing firms with 1-10 employees and the equation that omitted this control. Thus, given that none of the control variables had a significant impact on firm performance, and for reasons of parsimony and degrees of freedom, subsequent regression models were estimated with these variables omitted.

After the models were developed, diagnostic tests were administered to ensure that the data were appropriate for multiple regression analysis and the regression models fit the data. Plots of the residuals indicated that the assumptions of normality and linearity were meet. Studentized Deleted Residuals were used to determine that no influential outliers were present. Variance Inflation Factor analysis provided evidence that multicollinearity among the independent variables was not an issue for the models that did not include interactions, however, it was a problem for the models that included interactions (see discussion in the Results Section).

Results

The Results Section is organised as follows. First, I present preliminary analysis of the collaborate-independent dichotomy. Second, I discuss the results of building up the regression models for the first level of analysis (Models 1a-1d), the collaborate-independent (where independent firms are classified as either choosing not to collaborate or can't collaborate) comparison. Third, I present the results of the more fine-grained level of analysis (Models 2a-2d), type of collaboration versus independence. Fourth, I briefly summarise the reasons why many firms do not collaborate. Finally, I discuss the results of *post hoc* analysis, used to shed some light on the main results. For clarity, the model numbers used in Tables 2, 3 and 4 of the Results Section refer to the level of analysis being investigated: (1) for the collaborate-independent comparison and (2) for the analysis that incorporates the type of collaborative relationship. The letter suffixes, a-d, for each model number, refer to the sets of independent variables included in that particular regression model (e.g., (a) refers to the set of environment variables). Thus, for example, Model 1b in Table 2 looks at the first level of analysis and includes both the set of environmental variables and the set of strategic orientation variables.

Results Using the Collaborate-Independent Dichotomy

Table 1 compares the means of both the subjective and objective performance measures for firms that collaborate with those for firms that are independent. The results of Table 1 indicate that there are no performance differences between these two groups of firms for any of the subjective or self-reported performance measures. This exploratory analysis suggests that any of the consequences of collaboration cannot be detected at such a general level of analysis. Therefore H_1, which is the most conservative hypothesis regarding the effects of collaboration, is not supported.[9]

[9] While there are no significant differences for any of the contrasts presented in Table 1, all the contrasts are in the hypothesised direction and therefore the reason the data fail to support the hypothesis may be due to the small sample size and/or the large standard deviations.

TABLE 1
Collaboration versus Independence: A Comparison of Performance Measures

Performance Measure	Collaborate			Independent				
	N	Mean	Standard Deviation	*N*	Mean	Standard Deviation	*t*-value	*p*-value[a]
Performance Score	44	5.09	1.04	45	4.84	1.04	-1.15	.25
Growth/share	45	5.18	1.24	48	4.96	1.28	-.83	.41
Profit	45	4.93	1.15	47	4.79	1.29	-.53	.60
Future Position	46	5.14	1.05	47	4.83	1.14	-1.35	.18
1998 ROI (%)	18	39.57	104.45	19	19.68	16.84	-.82	.42
Average Sales Growth (%)	18	20.10	27.57	17	10.97	15.61	-1.20	.24
Average Income Growth (%)	14	15.75	34.17	22	11.28	21.94	-.48	.64
1998 ROS (%)	19	8.55	8.30	13	5.01	4.50	-1.40	.17

[a](two-tailed *t*-test).

Table 2 presents the results using 1998 subjective measures of performance as the dependent variable in the regression analysis of Models 1a-1d. Model 1a includes the environmental variables, Model 1b adds the strategic orientation measures, and Model 1c incorporates the collaboration variables, while Model 1d includes the proposed moderators. Three significance levels are recognised for all analyses: $p < .10$, $p < .05$, and $p < .01$.

Model 1a of Table 2[10] reports the effect of the environmental variables on each measure of performance. For three of the four measures of performance, the *F*-statistic was insignificant, indicating that the set of environmental variables did not influence the performance of firms in this sample. These results were expected for degree of internationalisation and industry-level collaboration; only their interaction with collaboration was hypothesised as influencing performance. H_{5b} predicted that technological turbulence would have a direct, positive influence on performance, but the results do not support this hypothesis. The significant (.17; p=.05), positive coefficient for degree of internationalisation when future position is the dependent variable was also unexpected.

[10] All tables show unstandardised beta coefficients, since standardised coefficients for dummy variables are inappropriate. However, as previously discussed, both the environmental and strategic orientation measures were scaled so that they had a range of 1-7, allowing the unstandardised beta coefficients to be used to compare effects of a unit increase in each scale.

TABLE 2
The Effect of Collaboration on Subjective Measures of Performance

	Performance Score				Growth/share			
Independent Variables	**Model 1a**	**Model 1b**	**Model 1c**	**Model 1d**	**Model 1a**	**Model 1b**	**Model 1c**	**Model 1d**
Constant	4.81[a]	2.54[a]	2.78[a]	2.81[a]	5.40[a]	3.22[a]	3.26[a]	3.69[a]
	(.50)	(.72)	(.72)	(.82)	(.59)	(.93)	(.95)	(1.06)
Technological turbulence (TT)	ns	-.25[b]	-.26[b]	-.25[c]	ns	-.32[b]	-.31[b]	-.30[c]
		(.10)	(.10)	(.13)		(.13)	(.13)	(.16)
Degree of internationalisation (DI)	ns	ns	ns	ns	ns	ns	ns	ns
Industry-level collaboration (IC)	ns	ns	ns	ns	ns	ns	ns	ns
Customer orientation		.25[c]	.29[b]	.26[c]		ns	ns	ns
		(.13)	(.13)	(.14)				
Collaborative orientation		ns	-.19[c]	ns		ns	ns	ns
			(.10)					
Technological orientation		.61[a]	.58[a]	.59[a]		.59[a]	.57[a]	.61[a]
		(.15)	(.15)	(.15)		(.18)	(.19)	(.19)
Collaborate (C)			.08	.24			.22	.09
			(.22)	(.95)			(.28)	(1.24)
Can't collaborate			-.53	-.60[c]			.12	.08
			(.32)	(.35)			(.41)	(.44)
C × TT				X				X
C × DI				X				X
C × IC				X				X
R^2	.00	.33[a]	.36[a]	.36[a]	.02	.22[a]	.22[a]	.25[a]
(adj R^2)	(-.03)	(.28)	(.29)	(.27)	(-.02)	(.16)	(.15)	(.15)
F-value for change in R^2		13.27	1.85	.20		7.38	.30	.89
N	89	89	89	89	93	93	93	93
p-value for change in R^2		.00	.16	.90		.00	.75	.45

[a]Significant at $p < .01$; [b]$p < .05$; [c]$p < .10$ (two-tailed t-test).

Notes: The numbers in parentheses are standard errors. ns = not significant. X = no moderator effect because of correlation with collaborate variable.

TABLE 2, continued
The Effect of Collaboration on Subjective Measures of Performance

	Profit				Future Position			
Independent Variables	**Model 1a**	**Model 1b**	**Model 1c**	**Model 1d**	**Model 1a**	**Model 1b**	**Model 1c**	**Model 1d**
Constant	5.32 [a]	2.87 [a]	3.27 [a]	3.49 [a]	3.78 [a]	ns	1.29 [c]	ns
	(.58)	(.88)	(.86)	(.97)	(.58)		(.71)	
Technological turbulence (TT)	ns	-.23 [c]	-.25 [b]	-.36 [b]	ns	ns	-.17 [c]	ns
		(.12)	(.12)	(.15)			(.10)	
Degree of internationalisation (DI)	ns	ns	ns	ns	.17 [b]	ns	ns	.22 [a]
					(.08)			(.10)
Industry-level collaboration (IC)	ns	ns	ns	ns	ns	ns	ns	ns
Customer orientation		.36 [b]	.41 [a]	.43 [a]		.28 [b]	.30 [b]	.24 [a]
		(.16)	(.15)	(.16)		(.12)	(.12)	(.13)
Collaborative orientation		-.23 [c]	-.27 [b]	-.26 [b]		ns	-.16 [c]	ns
		(.12)	(.12)	(.13)			(.09)	
Technological orientation		.50 [a]	.47 [a]	.48 [a]		.69 [a]	.68 [a]	.69 [a]
		(.18)	(.17)	(.18)		(.14)	(.14)	(.14)
Collaborate (C)			.02	-.77			-.05	1.63 [b]
			(.26)	(1.14)			(.21)	(.89)
Can't collaborate			-1.01 [a]	-1.10 [a]			-.46	ns
			(.38)	(.41)			(.32)	
C × TT				X				X
C × DI				X				-.29 [b]
C × IC				X				X
R^2	.01	.25 [a]	.32 [a]	.33 [a]	.09 [b]	.43 [a]	.44 [a]	.49 [a]
(adj R^2)	(-.03)	(.20)	(.25)	(.24)	(.06)	(.39)	(.39)	(.42)
F-value for change in R^2		9.26	3.87	.47		17.17	1.10	2.39
N	92	92	92	92	93	93	93	93
p-value for change in R^2		.00	.03	.71		.00	.34	.08

[a]Significant at $p < .01$; [b]$p < .05$; [c]$p < .10$ (two-tailed t-test).
Notes: The numbers in parentheses are standard errors. ns = not significant. X = no moderator effect because of correlation with collaborate variable.

Model 1b of Table 2 adds the strategic orientation variables to the previous model. For all performance measures, addition of the strategic orientation set of variables significantly increases the variance explained. H_{8a} predicted a positive relationship between customer orientation and performance, while H_{8c} also proposed a positive relationship between technological orientation and performance. Customer orientation has a significant, positive effect on three of the four measures: performance score (.25; p=.06), profit (.36; p=.02), and future position (.28; p=.03). Technological orientation is positively related to all four measures of performance: performance score (.61; p=.00), growth/share (.59; p=.00), profit (.50; p=.01), and future position (.69; p=.00). These results support both H_{8a} and H_{8c}. Collaborative orientation has a marginally significant, negative effect on a firm's profitability (-.23; p=.06), although it has no significant effect on any of the other three performance measures. Thus H_{9a}, which proposed that collaborative orientation would have a positive effect on firm performance, is not supported. Addition of the set of strategic orientation variables to the model also affected the coefficient for technological turbulence. For the models with profit (-.23; p=.07), growth/share (-.32; p=.02) and performance score (-.25; p=.02) as the dependent variable, addition of the strategic orientation variables results in technological turbulence having a significant, negative effect on performance. The resulting significance of technological turbulence in this model provides partial support for H_{5b}, which proposed that technological turbulence would have a negative impact on firm performance. For the model with future position as the dependent variable, the inclusion of the strategic orientation variables in the model also resulted in the coefficient for degree of internationalisation losing its significance. These results, which reverse those found in Model 1a, will be addressed in the Discussion Section.

Model 1c of Table 2 adds the collaborate and can't collaborate variables to the model. The baseline or comparison group is those firms that choose not to collaborate. The addition of these two variables is significant only when profit performance is the dependent variable. For the remaining three models, neither collaborate nor can't collaborate have any impact on performance. Thus, the results for Model 1c, which compares collaborating firms with firms that remain independent by choice, confirm the initial t-test comparisons: collaborating firms do not have higher performance levels than firms who choose not to collaborate. However, as Table 2 illustrates, partial support is found for H_{3a}, which

proposed that firms that could not collaborate would perform worse than firms who choose not to collaborate, and for H_{3b}, which predicted that these firms would also perform worse than firms that do collaborate. With profitability as the performance measure, can't collaborate has a significant (-1.00; p=.00), negative effect on performance, however, can't collaborate does not have an effect on the other three performance measures.

Model 1d of Table 2 includes the proposed environmental moderators. Due to the smaller than desired sample size, the environmental and strategic orientation interactions could not be tested together. The inclusion of the environmental moderators (C×TT, C×DI, and C×IC) does not significantly increase the R^2 for three of the four performance measures (performance score, growth/share, and profit). Three notable things happen when the interactions are included in the model that has future position as the dependent variable. First, degree of internationalisation regains its significance (.22; p=.02). Second, the collaborate variable becomes marginally significant, exerting a positive effect on performance (1.63; p=.07). Finally, the interaction between collaboration and degree of internationalisation (C×DI) is significant (-.29; p=.03). However, for several reasons, these results must be interpreted cautiously. First, the coefficient for collaborate is very unstable, indicating that this sudden change to significance is not robust.[11] Second, the addition of the environmental interactions reduces the ratio of variables-to-cases well below the generally accepted level of 10:1 (for Model 1d in Table 2, the ratio was approximately 8.2:1). Finally, the Variance Inflation Factors (VIF) for the collaborate variable and each of the interaction terms are well above 10, a level that indicates serious multicollinearity.[12] Due to these confounding factors, further interpretation of these results is inappropriate.

These findings do not support H_{5a}, H_6 and H_7, which proposed that the interaction between collaboration and technological turbulence, degree of internationalisation, and industry-level collaboration, respectively, would influence performance. However, two of the

[11] Sensitivity analysis, as well as slight changes to the specification of the model resulted in the coefficient for the 'collaborate' variable alternating between significance and insignificance.

[12] One factor that might have contributed to the high level of multicollinearity was the lack of variance in the environmental conditions within collaborating and independent firms. Firms in particular environments were much more likely to collaborate than were firms in other types of environments (hence the multicollinearity). The interactions examine the effect of collaboration on performance given different environmental circumstances, yet to adequately identify such an interaction requires variance in environmental conditions

factors already discussed, the low ratio of variables-to-cases and the high VIFs, reduced the power of my analysis to uncover any true interaction effects.[13] Thus, while the results suggest that the hypotheses relating to the moderators are not supported, further research using a larger sample size is necessary to confirm my results.

With none of the environmental interaction terms significant, the model was re-estimated to include the interaction between collaborate and collaborative orientation (C×CO). Given their non significance, degree of internationalisation and industry-level collaboration were removed from the revised model, which is displayed in Model 1d of Table 3, while technological turbulence was removed from the model which had future position as the dependent variable. As Model 1d illustrates, for all performance measures, the interaction between collaboration and collaborative orientation (C×CO) was insignificant, providing no support for H_{9b}. Again, however, the VIFs for the collaborate variable and the interaction between collaboration and collaborative orientation were much higher than recommended values.

Technological turbulence aside, my results show that none of the environmental variables or any of the proposed interactions with collaboration are associated with performance. The models were therefore re-estimated to reflect these results. Model 1c in Table 3 displays the final regression models for each performance measure. The removal of degree of internationalisation and industry-level collaboration yielded slight changes in the significance for two of the independent variables. In the model for performance score, collaborative orientation has a significant (-.21; p= .03), negative impact on performance, while can't collaborate also becomes marginally significant (-.56; p=.07) - impacting performance negatively. In the model for future position, collaborative orientation has a significant (-.19; p=.02), negative effect on performance.

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within collaborating and non-collaborating firms.

[13] A serious consequence of multicollinearity is highly unstable partial coefficients for those independent variables that are highly collinear. Moreover, large standard errors mean a lessened probability of rejecting the null, thereby reducing the likelihood of obtaining significant interaction terms (Cohen and Cohen 1983).

TABLE 3
Revised Model: The Effect of Collaboration on Subjective Measures of Performance

	Performance Score				Growth/share			
Independent Variables	**Model 1a**	**Model 1b**	**Model 1c**	**Model 1d**	**Model 1a**	**Model 1b**	**Model 1c**	**Model 1d**
Constant	4.93 [a]	2.52 [a]	2.74 [a]	2.56 [a]	5.46 [a]	3.18 [a]	3.19 [b]	3.32 [b]
	(.40)	(.71)	(.71)	(.79)	(.47)	(.92)	(.93)	(1.03)
Technological turbulence	ns	-.24 [b]	-.26 [b]	-.26 [b]	ns	-.32 [b]	-.31 [b]	-.31 [b]
		(.10)	(.10)	(.10)		(.12)	(.13)	(.13)
Customer orientation		.26 [c]	.29 [b]	.29 [b]		ns	ns	ns
		(.13)	(.13)	(.13)				
Collaborative orientation (CO)		-.17 [c]	-.21 [b]	ns		ns	ns	ns
		(.09)	(.10)					
Technological orientation		.59 [a]	.56 [a]	.56 [a]		.58 [a]	.56 [a]	.56 [a]
		(.14)	(.14)	(.14)		(.18)	(.18)	(.18)
Collaborate (C)			.05	.46			.18	.13
			(.21)	(.85)			(.27)	(.39)
Can't collaborate			-.56 [c]	-.54 [c]			.14	-.11
			(.31)	(.31)			(.39)	(1.06)
C × CO				X				X
R^2	.00	.32 [a]	.35 [a]	.36	.01	.22 [a]	.22 [a]	.22 [a]
(adj R^2)	(-.01)	(.29)	(.31)	(.30)	(-.01)	(.18)	(.17)	(.16)
F-value for change in R^2		13.35	1.99	.26		7.76	.24	.08
N	89	89	89	89	93	93	93	93
p-value for change in R^2		.00	.14	.61		.00	.79	.78

[a]Significant at $p < .01$; [b]$p < .05$; [c]$p < .10$ (two-tailed t-test).

Notes: The numbers in parentheses are standard errors. ns = not significant.

X = no moderator effect because of correlation with collaborate variable.

TABLE 3, continued
Revised Model: The Effect of Collaboration on Subjective Measures of Performance

	Profit				Future Position			
Independent Variables	**Model 1a**	**Model 1b**	**Model 1c**	**Model 1d**	**Model 1a**	**Model 1b**	**Model 1c**	**Model 1d**
Constant	5.08 [a]	2.82 [a]	3.16 [a]	2.83 [a]		ns	1.23 [c]	ns
	(.46)	(.87)	(.86)	(.95)			(.71)	
Technological turbulence	ns	-.22 [c]	-.26 [b]	-.27 [b]	ni	ni	ni	ni
		(.12)	(.12)	(.12)				
Customer orientation		.36 [b]	.40 [a]	.40 [a]		.32 [a]	.34 [a]	.34 [a]
		(.16)	(.15)	(.15)		(.12)	(.12)	(.12)
Collaborative orientation (CO)		-.27 [b]	-.31 [a]	ns		-.17 [b]	-.19 [b]	ns
		(.11)	(.11)			(.08)	(.09)	
Technological orientation		.45 [a]	.44 [a]	.45 [a]		.59 [a]	.57 [a]	.56 [a]
		(.17)	(.17)	(.17)		(.11)	(.11)	(.11)
Collaborate (C)			-.07	.68			.04	.37
			(.25)	(.97)			(.20)	(.80)
Can't collaborate			-1.03 [a]	-.99 [a]			-.30	-.29
			(.37)	(.38)			(.30)	(.31)
C × CO				X				X
R^2	.00	.24 [a]	.30 [a]	.31 [a]		.40 [a]	.41 [a]	.41 [a]
(adj R^2)	(-.01)	(.20)	(.26)	(.25)		(.38)	(.38)	(.37)
F-value for change in R^2		8.94	4.04	.64			.62	.18
N	92	92	92	92		93	93	93
p-value for change in R^2		.00	.02	.43			.54	.67

[a]Significant at $p < .01$; [b]$p < .05$; [c]$p < .10$ (two-tailed t-test).
Notes: The numbers in parentheses are standard errors. ns = not significant. ni = not included in the model.
X = no moderator effect because of correlation with collaborate variable.

Results Using Type of Collaboration

To conduct a more detailed test of H_1 and H_{3b}, and to test H_{10a} to H_{12}, the models were re-estimated with the more fine-grained collaborative relationship variables. Cases of collaboration were broken down into marketing-only collaboration, development and marketing collaboration, and other forms of interfirm collaboration.[14] Independent firms, as in the previous analysis, were categorised as firms that either remain independent by management's choice or firms that do so because they can't collaborate. Table 4 displays the results for this second level of analysis.[15] As with the revised model from the first level of analysis, degree of internationalisation and industry-level collaboration were removed from the analysis for all performance measures, while technological turbulence was omitted from the model with future position as the dependent variable. As before, the beta coefficients represent the effect of each form of collaboration relative to the control group, which are firms that choose not to collaborate. Model 2c includes the various types of collaboration in the model, while Model 2d includes the proposed moderators.

The results of Model 2c suggest the following: compared with firms who choose not to collaborate, neither marketing-only collaboration nor combined development and marketing collaboration have an effect on overall performance nor any of the three individual aspects of performance, confirming the first level of analysis results for H_1. However, other interfirm collaboration has a significant, negative effect on the overall performance score (-.94; p=.01), as well as on each of the three aspects of performance: growth/share (-.96; p=.03), profit (-1.05; p=.01), and future position (-.78; p=.02).

H_{3b} proposed that firms that can't collaborate would perform worse than firms that are collaborating. To test the difference in beta coefficients for group means, I used a t-statistic prescribed by Cohen and Cohen (1983, p.195). Using the beta coefficients in Table 4, t-values were computed to compare the beta values for each of the three types of collaboration with the betas for the 'can't collaborate' group of firms. A consistent pattern was found when comparing the performance means of groups: firms with either

[14] Refer to the discussion of the Variables and Measures in the Methodology Section for the reason development-only collaboration was not included in any of the analyses.

[15] The minor differences in the beta coefficients of Model 2b in Table 4 compared with those of Model 1b in Table 3 are attributable to the removal of the two cases of development-only collaboration (as discussed in the Variables and Measures Section).

TABLE 4
The Effect of Type of Collaboration on Subjective Measures of Performance

	Performance Score				Growth/share			
Independent Variables	**Model 2a**	**Model 2b**	**Model 2c**	**Model 2d**	**Model 2a**	**Model 2b**	**Model 2c**	**Model 2d**
Constant	4.87 [a]	2.36 [a]	2.50 [a]	2.74 [a]	5.36 [a]	2.96 [a]	2.85 [a]	2.91 [a]
	(.40)	(.71)	(.68)	(.81)	(.47)	(.92)	(.90)	(1.07)
Technological turbulence	ns	-.23 [b]	-.22 [b]	-.23 [b]	ns	-.30 [b]	-.27 [b]	-.28 [b]
		(.10)	(.10)	(.09)		(.13)	(.12)	(.12)
Customer orientation (CU)		.28 [b]	.32 [b]	.27 [c]		ns	ns	ns
		(.13)	(.12)	(.15)				
Collaborative orientation		-.18 [c]	-.24 [a]	-.26 [a]		ns	-.22 [c]	-.23 [b]
		(.09)	(.09)	(.09)			(.12)	(.12)
Technological orientation (TO)		.58 [a]	.58 [a]	.61 [a]		.58 [a]	.58 [a]	.61 [a]
		(.14)	(.13)	(.13)		(.18)	(.18)	(.18)
Marketing-only collaboration (MC)			.20 [ns]	ns			.32 [ns]	ns
			(.22)				(.29)	
Development and marketing collaboration (DMC)			.30 [ns]	ns			.55 [ns]	ns
			(.31)				(.42)	
Other interfirm collaboration			-.94 [a]	-.94 [a]			-.96 [b]	-.97 [b]
			(.32)	(.32)			(.44)	(.44)
Can't collaborate			-.55 [c]	-.55 [c]			.15 [ns]	ns
			(.29)	(.29)			(.37)	
MC × CU				X				X
DMC × TO				X				X
R^2	.00	.33 [a]	.46 [a]	.48 [a]	.01	.22 [a]	.31 [a]	.33 [a]
(adj R^2)	(-.01)	(.30)	(.40)	(.41)	(-.01)	(.19)	(.24)	(.24)
F-value for change in R^2		13.65	4.46	1.34		8.07	2.57	1.03
N	87	87	87	91	91	91	91	91
p-value for change in R^2		.00	.00	.27		.00	.04	.36

[a]Significant at $p < .01$; [b]$p < .05$; [c]$p < .10$ (two-tailed t-test).

Notes: The numbers in parentheses are standard errors. ns = not significant.

X = no moderator effect because of correlation with MC or DMC.

TABLE 4, continued
The Effect of Type of Collaboration on Subjective Measures of Performance

	Profit				Future Position			
Independent Variables	**Model 2a**	**Model 2b**	**Model 2c**	**Model 2d**	**Model 2a**	**Model 2b**	**Model 2c**	**Model 2d**
Constant	5.01[a]	2.59[a]	2.81[a]	3.07[a]		ns	ns	ns
	(.46)	(.88)	(.83)	(.98)				
Technological turbulence	ns	-.20[c]	-.23[b]	-.24[b]	ni	ni	ni	ni
		(.12)	(.12)	(.12)				
Customer orientation (CU)		.39[b]	.44[a]	.38[a]		.33[a]	.33[a]	.34[a]
		(.16)	(.15)	(.18)		(.12)	(.12)	(.15)
Collaborative orientation		-.27[b]	-.33[a]	-.35[a]		-.17[b]	-.20[b]	-.20[b]
		(.11)	(.11)	(.11)		(.08)	(.08)	(.09)
Technological orientation (TO)		.45[a]	.46[a]	.50[a]		.58[a]	.60[a]	.60[a]
		(.17)	(.16)	(.16)		(.11)	(.11)	(.11)
Marketing-only collaboration (MC)			.03[ns]	ns			.19[ns]	ns
			(.27)				(.22)	
Development and marketing collaboration (DMC)			.31[ns]	ns			.11[ns]	ns
			(.38)				(.32)	
Other interfirm collaboration			-1.05[a]	-1.06[a]			-.78[b]	-.78[b]
			(.40)	(.40)			(.34)	(.34)
Can't collaborate			-1.02[a]	-1.02[a]			-.30[ns]	ns
			(.35)	(.35)			(.30)	
MC × CU				X				X
DMC × TO				X				X
R^2	.00	.25[a]	.39[a]	.41[a]		.41[a]	.47[a]	.47[a]
(adj R^2)	(-.01)	(.22)	(.33)	(.34)		(.38)	(.42)	(.41)
F-value for change in R^2		9.54	4.45	1.46			2.34	.03
N	90	90	90	90		91	91	91
p-value for change in R^2		.00	.00	.24			.06	.97

[a]Significant at $p < .01$; [b]$p < .05$; [c]$p < .10$ (two-tailed t-test).
Notes: The numbers in parentheses are standard errors. ns = not significant. ni = not included in the model.
X = no moderator effect because of correlation with MC or DMC.

development-oriented or combined development- and marketing-oriented collaborations outperformed firms who could not collaborate, in terms of overall performance score (MC $p<.01$; DMC $p<.05$) and profit performance (MC $p<.01$; DMC $p<.01$). Firms involved in other forms of interfirm collaboration performed worse than firms who could not collaborate in terms of growth/share ($p<.05$), while performing at similar levels for the remaining performance measures. The results support H_{3b} for marketing-only collaboration and combined development and marketing collaboration, but not for other forms of interfirm collaboration.

The same *t*-statistic was used to test H_{10a} and H_{10c}, which predicted that both marketing-oriented collaboration and combined development and marketing collaboration would outperform other forms of interfirm collaboration. Across all four performance measures, both marketing collaboration and combined development and marketing collaboration had significantly (1 tailed test, $p<0.05$ for all comparisons) greater beta coefficients than those of the other interfirm collaboration group, thereby supporting H_{10a} and H_{10c}.

The value of moving from the first level of analysis to the second, more fine-grained level of analysis is apparent (i.e., from Model 1c in Table 3 to Model 2c in Table 4). The increases in the adjusted R^2 range from 4% for the model with future position as the dependent variable to 9% for the model with performance score as the dependent variable. As with the division of independent firms into 'choose not to' and 'can't collaborate', the categorisation of collaboration allowed more meaningful comparisons to be made about the relative benefits of different types of collaboration.

Model 2d of Table 4 adds the proposed interaction between the strategic orientations and collaboration (MC×CU and DMC×TO).[16] There is no support for H_{11}, which proposed that the customer orientation of a firm could enhance the performance effects of marketing-oriented collaborations, nor for H_{12}, which suggested that the technological orientation of a firm would enhance the performance effects of firms involved in development-oriented collaborations. However, it must be noted that, as with the previous level of analysis, the Variance Inflation Factor for each of these interaction variables was

[16] Combined development and marketing collaboration was used to test H_{12}, rather than development-only collaboration, which did not have enough cases to warrant inclusion in the analysis (refer to Footnote 8)

well above 10, indicating serious multicollinearity.[17]

Table 5 provides a summary of the hypothesis testing results. Of the 13 proposed hypotheses relating to collaboration, 3 are supported by the data, 7 not supported (including all six moderating hypotheses), and 3 were unable to be tested. Of the remaining 6 hypotheses, 4 are supported by the data. 1 is not supported, while one was unable to be tested.

Why Do Many Firms Not Collaborate?

This section summarises the findings related to Research Question 3, which asked, 'why do many firms not collaborate?' The previous results show that firms remaining independent by choice have similar performance levels to those firms that do collaborate. However, firms unable to collaborate were shown to perform worse than either firms that collaborate or firms that remain independent by choice. As Table 6 depicts, the most overwhelming reason for not collaborating, listed by 30 firms (48% of the independent sample), was because managers did not see that there was anything to be gained from collaborating (i.e., they chose not to collaborate). 9 firms (15%) in my sample did not collaborate because they could not find appropriate partners, either because there were no firms with skills and resources complementary to their own resource base or because firms they were interested in collaborating with were not willing to reciprocate. A total of 13 firms (21%) had not entered any collaborative relationships because the firm had a policy at the time that meant either they did not collaborate with *any* other firms or they did not collaborate with any of their competitors. 14 firms (23%) were concerned about the loss of proprietary information. Finally, 8 firms (13%) were concerned about the legal implications of collaborating, however, only one firm listed this as the exclusive reason for not collaborating.

Post Hoc Analysis

My results indicate that there are no performance differentials between firms that cooperate and firms who choose to remain independent. Prior to the discussion of these

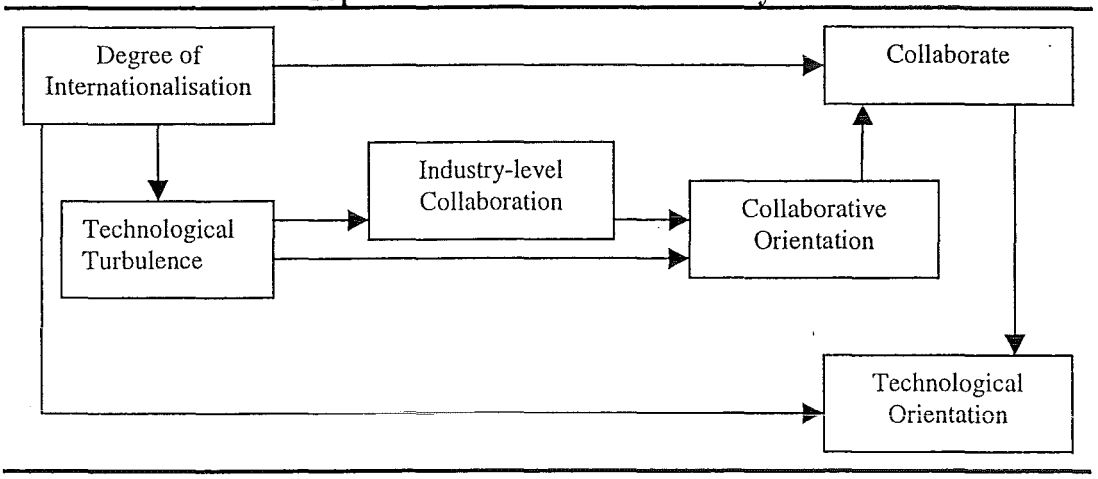
[17] This can primarily be put down to the small sample size for each group, with 26 or 27 (depending on the performance measure) firms involved in marketing-only collaboration and only 9 firms involved in development and marketing collaboration. The discussion in Footnote ? also applies.

TABLE 5
A Summary of Hypothesis Testing Results

Hypotheses		Empirical Results
H_1:	Performance will be greater for firms that collaborate than for firms that remain independent.	General test: not supported. Fine-grained test: not supported, opposite sign for other interfirm collaboration.
H_2:	Collaboration will improve firm performance.	Not tested.
H_{3a}:	Firms that can't collaborate will have lower performance than firms that choose not to collaborate.	Supported for profit and marginally supported for overall performance score.
H_{3b}:	Firms that can't collaborate will have lower performance than firms that do collaborate.	General test: supported for profit and marginally supported for overall performance score. Fine-grained test: supported for marketing-only collaboration and combined collaboration, not supported for other interfirm collaboration.
H_4:	Market turbulence has a positive, moderating effect on the relationship between collaboration and firm performance.	Not tested.
H_{5a}:	Technological turbulence has a positive, moderating effect on the relationship between collaboration and firm performance.	Not supported.
H_{5b}:	Technological turbulence is negatively associated with firm performance.	Partial support.
H_6:	Degree of internationalisation has a positive, moderating effect on the relationship between collaboration and firm performance.	Not supported.
H_7:	Industry-level collaboration has a negative, moderating effect on the relationship between collaboration and firm performance.	Not supported.
H_{8a}:	Customer orientation will be positively associated with firm performance	Supported.
H_{8b}:	Competitor orientation will be positively associated with firm performance	Not tested.
H_{8c}:	Technological orientation will be positively associated with firm performance	Supported.
H_{9a}:	Collaborative orientation will be positively associated with firm performance.	Not supported.
H_{9b}:	Collaborative orientation has a positive, moderating effect on the relationship between collaboration and firm performance.	Not supported.
H_{10a}:	Marketing-oriented collaboration will outperform other forms of inter-firm collaboration.	Supported.
H_{10b}:	Development-oriented collaboration will outperform other forms of interfirm collaboration.	Not tested.
H_{10c}:	Combined marketing and development oriented collaboration will outperform other forms of interfirm collaboration.	Supported.
H_{11}:	Customer orientation has a positive, moderating effect on the relationship between marketing-oriented collaboration and performance.	Not supported.
H_{12}:	Technological orientation will have a positive, moderating effect on the relationship between development-oriented collaboration and performance.	Not supported.

results, I present some *post hoc* analysis of several other related variables used in this study to try and shed some light on these findings. Where appropriate, relevant literature is cited to explain the results of this section. While collaboration may not result in greater performance, the decision to cooperate or remain independent may be the best strategy for a firm's management given prevailing internal and external factors. The following analyses look at some external factors that may impact the decision to collaborate. In Figure 3, I present a model of the analyses discussed in the following sections. To organise the presentation of these analyses better, I divide the overall discussion of the model into three sections. I first discuss some potential determinants of collaboration. In the second section, I examine the direct and mediated relationships among the environmental variables and collaborative orientation. Finally, I investigate the relationship between the environmental variables, collaboration and technological orientation.

FIGURE 3
Proposed Model for *Post Hoc* Analysis



Direct Antecedents to Collaboration

As Figure 3 depicts, collaborative orientation (i.e., the perceived benefits to collaborating) and degree of internationalisation are proposed as directly influencing the formation of collaborative agreements. The relationships among the study variables and interfirm collaboration were explored using a logistic regression procedure. The beta coefficients provided by a logistic regression procedure give the change in the logarithmic odds of obtaining the outcome variable when there is a change of one unit in the predictor variable.

If the beta for a variable is significant and positive, then the variable increases the odds of the outcome, which in this case is firm collaboration. In Table 6, I report the results of the logistic regression with collaborative activity as the dependent variable. Model 1 is the base model with firm size only, while Model 2 also includes degree of internationalisation. Finally, Model 3 includes collaborative orientation. Both degree of internationalisation and collaborative orientation have significant, positive beta coefficients, indicating that an increase in these two factors increases the odds of a firm collaborating. The positive association between degree of internationalisation and collaboration is consistent with past research that has indicated important links between international trade and collaborative activity (Morris and Hergert 1987).

TABLE 6
Logistic Regression Estimates of Influences on the Likelihood of Collaboration

Variable	Model 1	Model 2	Model 3
Constant	-1.18	-2.02 [a]	-3.86 [a]
Firm size	0.00	-1.04 [c]	-1.03 [c]
Degree of internationalisation		0.51 [a]	0.46 [a]
Collaborative orientation			0.45 [b]
Model Loglikelihood	123.91	113.96	109.8
Pseudo R^2	.04	0.14	0.18
Chi-square change	4.14 [b]	9.49 [a]	4.16 [b]
Hit Rate	54.84%	63.44%	65.59%

[a]Significant at $p < .01$; [b]$p < .05$; [c]$p < .05$ (two-tailed t-test).

The Effects of Environment on Collaborative Orientation

The previous section discussed collaborative orientation as a direct antecedent to collaborative activity. This section looks at the relationship between the environmental measures and collaborative orientation. Table A2 shows that collaborative orientation is positively related to degree of internationalisation (ρ=.22, p=.02), technological turbulence (ρ=.31, p=.00), and industry-level collaboration (ρ=.36, p=.00). The first regression model in Table 7 presents the analysis of collaborative orientation against degree of internationalisation, technological turbulence, and industry-level collaboration as the independent variables. Both technological turbulence (.16, p=.05), and industry-level collaboration (ρ=.25, p=.00), have significant, positive associations with collaborative orientation. These results are consistent with research examining the motives driving the formation of alliances. First, the more rapid the rate and extent of change in technology, the greater the perceived benefits of entering into cooperative agreements. Past research

has shown that one of the most widely cited motives for collaboration is the acquisition of new technical skills or technological capabilities in the face of rapidly changing technological environments (Hagedoorn 1993; Hamel 1991; Hamel et al. 1989; Shan 1990). Second, as an industry becomes more cooperative-minded, the greater are the perceived benefits to collaborating. As the number of firms involved in collaboration in an industry grows, the isomorphism occurring in the industry may lead managers to align their own attitudes with the emerging industry paradigm (Dollinger 1990). Table A2 also shows that technological turbulence is positively related to industry-level collaboration (ρ=.32, p=.00). Given that collaboration is one key method of acquiring technological capabilities, increased technological turbulence should lead more firms to enter cooperative activity, resulting in a higher level of industry collaboration. Research has shown that the formation of alliances is associated with the technological complexity and volatility inherent in an industry (Forrest 1990; Hagedoorn 1993; Hladik 1988).

Industry-level collaboration was therefore tested as a mediator of the technological turbulence-collaborative orientation relationship. I used Arnold's (1982) simple procedure to test whether industry-level collaboration was a mediator, the results of which are displayed in Table 7. First, industry-level collaboration was regressed on technological

TABLE 7
Regression of Collaborative Orientation on Environmental

Variable	DV = Collaborative Orientation	DV = Industry-level Collaboration	DV = Collaborative Orientation	DV = Collaborative Orientation
Technological Turbulence	.16[b]	.32[a]	.26[a]	.18[b]
Industry-level collaboration	.25[a]			.26[a]
Degree of internationalisation	.10[ns]			
F-value	8.26[a]	12.75[a]	11.18[a]	11.07[a]
Adjusted R^2	.17	.10	.09	.16

[a]Significant at $p < .01$; [b]$p < .05$ (two-tailed *t*-test).

turbulence; industry-level collaboration has a significant (.32; p=.00), positive beta coefficient. Second, collaborative orientation was regressed against technological turbulence. Again, technological turbulence exhibits a significant (.26; p=.00), positive effect on collaborative orientation. Finally, collaborative orientation was regressed on both technological turbulence and industry-level collaboration. Both variables have

significant, positive coefficients, however, the beta coefficient for technological turbulence is less than it was in the previous regression (.18; p=.02 compared with .26; p=.00), indicating that industry-level collaboration is a partial mediator of the effect that technological turbulence has on collaborative orientation.

The results of the previous two sections suggest the following: technological turbulence may have a direct and indirect (through its impact on industry-level collaboration) effect on collaborative orientation (i.e., the perceived benefits of collaborating). Industry-level collaboration may directly effect a manager's collaborative orientation. Furthermore, as discussed below, degree of internationalisation has an indirect effect on collaborative orientation through its impact on technological turbulence. Thus, these three environmental factors may all influence the perceived benefits of collaborating. Finally, collaborative orientation and degree of internationalisation directly impact the odds that a firm is collaborating. This series of results suggests that the environment in which a firm is operating may have some influence on managers' decisions to collaborate.[18]

Environment, Collaboration and Technological Orientation

This section examines the relationships among technological orientation, collaboration, and the environment. Technological turbulence is positively related to degree of internationalisation (ρ=.20, p=.03) and technological orientation (ρ=.50, p=.00), while degree of internationalisation is positively related to technological orientation (ρ=.25, p=.01). As Figure 3 depicts, it is proposed that technological turbulence will have a mediating effect on the degree of internationalisation-technological orientation relationship. A greater degree of internationalisation may increase the technological turbulence faced by New Zealand firms; entering overseas markets will increase the number of competitors and technology-related competitive actions. The more turbulent environment should, in turn, lead firms to develop and refine their technical capabilities in order to maintain a competitive position. Again, Arnold's (1982) three-step process for testing mediating effects was used, with the results shown in Table 8. First, technological

[18] Another possible argument is that manager *perceptions* of the environment, rather than the *actual* environmental conditions, differ among managers of collaborating and independent firms, with these perceptions then used as a basis in helping to decide whether or not to collaborate. However, there is no salient reason to suggest why there should be a difference in the way managers of collaborating and independent firms perceive their environment.

TABLE 8
Regression of Collaborative Orientation on Environmental Factors

Variable	DV = Technological Turbulence	DV = Technological Orientation	DV = Technological Orientation
Technological Turbulence	.18 [b]	.26 [a]	.11 [c]
Industry-level collaboration			.38 [a]
Degree of internationalisation			
F-value	4.66 [b]	7.21 [a]	20.88 [a]
Adjusted R^2	.03	.05	.27

[a]Significant at $p < .01$; [b]$p < .05$; [c]$p < .10$ (two-tailed *t*-test).

turbulence was regressed against degree of internationalisation; the coefficient for degree of internationalisation is positive and significant (.18, p=.03). Second, technological orientation was regressed on degree of internationalisation; again, the coefficient is positive and significant (.18, p=.01). Finally, technological orientation was regressed on both degree of internationalisation (.11, p=.07) and technological turbulence (.38, p=.00). The reduction in the size (.18 to .11) and significance of the beta coefficient for degree of internationalisation indicates that technological turbulence partially mediates the relationship between degree of internationalisation and technological orientation. These results suggest that a firm's level of technological orientation may in part be influenced by the prevailing environmental conditions.

The technological orientation for firms that collaborate is significantly greater than it is for firms that remain independent (collaborate, 5.10; independent, 4.44, t=3.60 (two-tailed), p=.00). This gives rise to the possibility, illustrated in Figure 3, that a higher technological orientation is a result of a firm's collaborative activity. This possibility is particularly relevant given the previous discussion, which highlighted that one of the most prevalent motives for collaboration is the acquisition of technology-related skills and capabilities (e.g., Hagedoorn 1993; Hamel et al. 1989). Table 9 presents the results of regressing technological orientation against collaboration. The adjusted R^2 is .10, with collaboration exerting a significant (.67; p=.00), positive effect on technological orientation. Moreover, as Table 9 shows, consistent with expectations, when technological orientation was regressed on the different types of collaboration, combined development and marketing collaborations had the most significant (.63; p=.04), positive effect on a firm's technological orientation. Further regressions, including degree of internationalisation and technological turbulence as independent variables, indicated that collaboration my act like a mediating variable between degree of internationalisation and technological

orientation.[19] While the temporal sequencing of my data for collaboration (measured in 1997) and technological orientation (measured in 1999) is a necessary condition for causality, it is not sufficient. The lack of a measure for technological orientation prior to collaborating inhibits the ability to infer any causality between collaborating and higher technological orientations. However, through collaboration, firms may be able to improve their technical capabilities.[20]

TABLE 9
Regression of Technological Orientation on Collaboration

Variable	DV = Technological Orientation	DV = Technological Orientation
Collaborate	.67 [a]	
Marketing-only collaboration		.39 [c]
Combined development and marketing collaboration		.63 [b]
Other interfirm collaboration		.52 [c]
Technological turbulence		.38 [a]
F-value	12.95 [a]	11.87 [a]
Adjusted R^2	.10	.29

[a]Significant at $p < .01$; [b]$p < .05$; [c]$p < .10$ (two-tailed *t*-test).

Finally, in the main results section, I discussed the significant, positive effect that technological orientation has on performance. Therefore, while collaboration may not directly impact performance, collaboration could have an indirect, positive influence on performance through its positive impact on technological orientation. Further research is required to empirically establish the proposed relationships and causal paths discussed in this section.

[19] These results are not shown, but are available from the author on request.
[20] In the Discussion Section I raise the argument for the reverse causality: technological orientation→collaboration.

Discussion

My discussion is broken down into sections pertaining to particular topic areas investigated in my thesis. In each section I elaborate on the relevant results, mention any caveats or limitations associated with the findings, and discuss avenues for future research. In the last section of the discussion, I address the managerial implications of my findings.

Collaboration and Performance

Overall, my results do not support H_1, which predicted a positive association between collaboration and performance. The results of the simple contrasts reported in Table 1 were in the hypothesised direction, however, none were significant. Moreover, as the results in Table 2 revealed, collaborating, when compared with firms that remain independent by choice, had no impact on any of the four subjective measures of performance. However, while my results show that there are no performance differences between *collaborating* firms and firms that *choose not to* collaborate, there is some evidence to suggest that both these groups outperform firms who are *unable to* collaborate. Both H_{3a}, which predicted that firms that can't collaborate will perform worse than firms that choose not to collaborate do, and H_{3b}, which proposed that firms that can't collaborate would perform worse than collaborating firms do, received partial support. Table 3 indicates that firms who can't collaborate perform worse in terms of profit performance and overall performance score. Firms often form collaborative relationships because they lack the ability, time, or money needed to internalise necessary capabilities or access resources. Firms that are able to enter collaborative relationships are more likely to be in a position to acquire the necessary skills or resources for competing in the future than are firms that are unable to find any partners (Singh and Mitchell 1996). These cooperative relationships may enhance the position of participating firms relative to those firms that can't collaborate. However, the issue of prior performance needs to be addressed before any concrete conclusions can be drawn.

Questionnaire length limited my ability to explore the issue of prior performance in more detail. Moreover, the small response to the self-reported 1994 financial figures meant that performance prior to the 1995-1997 window of collaboration could not be adequately controlled. This lack of a control for prior performance means that I cannot establish

whether collaboration improved firm performance; prior to collaborating, the performance of firms that eventually collaborated may have been greater than the performance of firms that were unable to collaborate. Thus, although the temporal sequencing of the collected collaboration and performance data provided the foundation for establishing causality, a characteristic lacking in most previous empirical studies, the inability of my study to control for prior performance means that any significant relationships are only associative, not casual.

While the above limitations restrict any definitive conclusions, my results do lead to some interesting propositions that future research could examine. At the heart of the issue is the relative performance of firms prior to entering collaboration. By addressing this issue, we will be able to determine if it is only poor performing firms that are collaborating, and subsequently reaching performance parity with firms that *choose not to* collaborate, or if collaboration is a natural progression for some firms, enabling them to continue to have performance parity with firms that *choose not to* collaborate. Finally, contrasting the prior performance of *collaborating* firms with firms that *can't* collaborate would allow us to test whether it is the poor performance of these firms that not only drives them to want to collaborate (i.e., as a way to try to boost flaying performance), but also restricts some of them (because they are perceived to be unattractive firms to collaborate with) from getting partners.

Using the relative performance levels (1998) uncovered in my study for each group of firms, I developed three scenarios based on possible prior performance levels (1994) for each group (see Table 10). The Type 1 scenario depicts the situation in which collaboration actually leads to improvements in performance, that is, firms that enter collaborative agreements are, over time, able to improve their relative performance. In this situation, firms lucky enough to become involved in collaboration benefit from such activity, while those firms who miss out are unable to improve their performance. The Type 2 scenario depicts both the rational choice model and the poor performance-collaboration hypothesis in action. In this situation, both collaborators and firms that choose to remain independent have similar prior performance levels. For these two groups of firms, the decision to collaborate is a rational choice based on internal and external conditions, which in turn, leads to similar performance levels for these two groups in 1998.

Again, the low performance of the can't collaborate group means they desire to enter into cooperation as a means for potentially improving their performance, however, their undesirability as partners in collaboration mean they are unable to collaborate. Finally, the Type 3 scenario depicts the situation in which the decision to collaborate is a rational choice for all groups, however, constraining factors inhibit some firms from collaborating. In this situation, all firms have similar levels of performance prior to the decision to collaborate. During the period of collaborative activity (1995-1997 in this study), two groups, the collaborators and can't collaborate, decide that it would be in their best interest to enter into some form of collaborative activity. However, only one group, the collaborators, is able to enter such agreements, resulting in the can't collaborate groups' performance levels falling relative to the other two groups. Of the Type 2 and Type 3 situations, it is more likely for the Type 2, or some combination of Type 2 and 3 to prevail in reality, rather than only the Type 3 situation.

TABLE 10
Prior Performance-Based Scenarios for Examining the Effects of Collaboration

	1994 Performance	Collaborate	1998 Performance
Type 1			
Collaborate	low	yes	high
Can't collaborate	low	no	low
Choose not to collaborate	high	no	high
Type 2			
Collaborate	high	yes	high
Can't collaborate	low	no	low
Choose not to collaborate	high	no	high
Type 3			
Collaborate	same	yes	high
Can't collaborate	same	no	low
Choose not to collaborate	same	no	high

Finally, a worthwhile avenue for future research to pursue is investigating the moderating effect of firm size on the collaboration-performance relationship. Much of the research in the small business literature (e.g., Rosenfeld 1996; Smith 1991) has suggested that collaboration is one of the best mechanisms available for small and medium-sized firms to improve their performance and compete more effectively against larger firms. My data did not allow for a test of this proposition, but future research could examine the possibility that collaboration is more effective at enhancing the competitive position of smaller firms.

Why Firms Don't Collaborate

The previous discussion highlights that want of collaboration may be associated with lower levels of firm performance. For at least some of the firms in my study, the reason a firm could not collaborate was due to the difficulty of finding appropriate partners. However, my research only grazes the surface when it comes to examining the reasons that these firms could not find appropriate partners. As I argued in my conceptual framework, there are several factors that may constrain a firm from entering a collaborative relationship. Research that more closely examines the relevant theoretical perspectives would aid our understanding of the constraints faced by managers when trying to collaborate with other firms. More generally, it would be beneficial to understand why so many firms do not use alliances. My research suggests that environmental conditions, company policy, legal issues, fear of losing proprietary knowledge, and generally unfavourable attitudes to collaboration contribute to the decision to remain independent. These issues provide rich opportunities to illuminate some of the key reasons behind firms not collaborating. For example, why do some managers have such negative attitudes toward collaborating? Is this due to bad collaborative experiences in the past? Or rather, is it due to managers' individual orientations or belief systems? Lawton Smith et al. (1991) found that the loss of control often experienced when collaborating, particularly for smaller businesses, was a disincentive to enter into further cooperative arrangements.

As I discussed in the conceptual framework and methodology sections, my research classified firms that had company policy that constrained managers from collaborating, as 'choosing not to collaborate'. This was done on the basis that such policies are based on a conscious decision by management. However, this classification may be inappropriate. These policies might have been developed in a bygone era and no longer hold relevance in today's business conditions. If this is the case, then these constraints faced by managers may be detrimental to these firms. Organisational policies often keep managers from undertaking actions that would be beneficial in particular business situations (Nelson and Winter 1982; Hannan and Freeman 1989). When the group of firms classified as 'choose not to collaborate' was broken down into company policy and limited benefits, the performance contrasts revealed that the means for firms with a company policy of not collaborating were lower than those firms that simply did not believe there was anything to

be gained from collaborating.[21] A compelling extension of this exploratory research would be to develop a more rigorous categorisation procedure for firms not collaborating, and examining for any performance differences across the groups.

Type of Collaboration and Performance

The results of the second level of analysis, which incorporated the type of collaborative activity, provided a more detailed test of H_1 and H_{3b}. Consistent with the results of the previous analysis, there were no differences in performance between firms involved in marketing collaborations or combined development and marketing collaborations and firms that choose not to collaborate. However, contrary to H_1, firms involved in other forms of collaboration performed worse on all the performance measures than did firms that choose not to collaborate. The results for this group were also contrary to H_{3b}, which predicted that firms that can't collaborate would perform worse than firms that collaborate do. Firms involved in other forms of collaboration had worse growth/share performance than the can't collaborate group did, while performing at similar levels for the remaining performance measures. The results were consistent with H_{10a} and H_{10c}, which predicted that marketing-oriented collaboration and combined development- and marketing-oriented collaboration would have higher performance levels than other forms of collaboration, respectively. Across all four performance measures, both of these types of collaboration outperformed other forms of collaboration. Overall, then, my results suggest that collaborative activity outside the core areas of marketing or research and development may be detrimental to firm performance. The category of other forms of collaboration included out-licensing relationships, manufacturing agreements and agreements that could not be classified. Both licensing and manufacturing agreements raise conflicting issues regarding business performance. Out-licensing of technology and production-by-proxy agreements might be a sign of commercialisation weakness (Mitchell and Singh 1996; Varadarajan and Cunningham 1995). The excessive dependence on such agreements could lead firms to lose their R&D and manufacturing capabilities, although this would be expected to be a gradual process (Varadarajan and Cunningham 1995). However, the very small number of firms in this category (9) means that care should be taken in interpreting these results. More generally, this caution regarding the small sample size also applies to the other two

[21] The small sample size prohibited the significance of these contrasts.

types of collaboration (marketing-only (26), combined (12)). The results for the second level of analysis should at best be considered exploratory - further research with a larger data set is necessary for establishing greater confidence in my results. However, given the consistent pattern of my results, further examination of the differential impact of various types of collaboration seems warranted. One avenue for future research lies in examining the conditions in which development-oriented research may impact performance. Due to data constraints, I was unable to investigate the effect of the interaction between technological turbulence and collaboration. Given the growing research that suggests that the complexity and increasingly rapid technological change inherent in industries is a dominant motive for firms to cooperate (Hagedoorn 1993; Hamel 1991), it would be beneficial to examine whether development-oriented collaborations in environments such as these influence the performance of participating firms.

The Moderating Effects of Environment and Strategic Orientation

None of the hypotheses related to the proposed moderators of the collaborate-performance relationship were supported, however, this is more likely due to several problems with the data set, rather than a lack of support for these hypotheses *per se*. In the Results Section, I discussed the issue of a smaller than desired ratio of variable-to-cases and problems of multicollinearity. The first problem relates to the small sample size of my study, particularly given the number of independent variables that were examined when incorporating the interaction terms. The stringent criteria for selecting collaborating firms was deliberately designed to maximise the potential of the study to identify any relationship between collaboration and performance. However, in restricting firms eligible to be in the sampling frame to such a small number (121) and taking into account nonresponse rates, the final sample size of collaborating firms was less than desired. With respect to the issue of multicollinearity, Footnote 12 discussed the implications of the lack of variance in the proposed moderating variables within the collaborate and independent groups of firms. To examine the proposed moderators, future research needs to ensure that an acceptable distribution of responses is achieved for the environmental measures within each of the two firm categories (i.e., firms that collaborate and firms that remain independent).

Discussion of Post Hoc Analysis

The *post hoc* analysis was conducted to help shed some light on the findings presented in the main section. The results of this analysis suggest that managerial perceptions of the degree of internationalisation required for firm success and managers' collaborative orientation, which itself is associated with perceptions of environment conditions, are positively related with collaborative activity. This result is consistent with research by Dickson and Weaver's (1997) that found how a firm's key manager perceives the environment to be a significant determinant of alliance use. My results also show that managers' collaborative orientation (the perceived benefits to collaboration) is partly influenced by the environmental conditions inherent in an industry. The environment influences the collaborative orientation of managers by affecting their ability to comprehend the rewards for cooperative behaviour (Dollinger 1990; Baden-Fuller). Very stable environments will not promote cooperation because they remove many of the motivations for joining a collaborative relationship (Dollinger and Golden 1992). These results suggest that for firms in my sample, the decision to collaborate or remain independent may have been an appropriate strategy for these firms given prevailing environmental conditions. However, as I mentioned in the discussion of the moderators, although there were significant differences in the environmental conditions faced by collaborating and non-collaborating firms, there was little variance in the environmental conditions faced within these two groups. This lack of variance meant I was unable to test for misfit between the environment and firms' collaborative strategy. Given my results and the work of other researchers that have investigated the link between environmental conditions and collaboration (Forrest 1990; Hagedoorn 1993), the examination of the environment-collaboration interaction on performance merits further attention.

My results also revealed that the technological orientation of firms involved in collaboration is much higher than it is for firms that remain independent. However, the question that still needs to be answered is, 'does collaboration lead to a higher technological orientation?' The direction of causality between these two variables can be argued either way. Technology-oriented firms have the ability and will to acquire a substantial technological background and use it in the development of new products (Gatignon and Xuereb 1997). Through collaboration, firms can acquire new technical skills or technological capabilities from partner firms (Hagedoorn 1993; Hamel et al. 1989;

Khanna 1996) and speed capability development (Grant and Baden-Fuller 1995), thereby increasing the technological orientation of the firm. However, technologically-oriented firms my want to leverage their existing technical capabilities in the development of new products and technologies by entering collaborative relationships with other firms. This would indicate that technologically-oriented firms are more inclined to enter relationships than are firms with lower level technological orientations. In reality, the two variables are likely to be inextricably intertwined; firms finding they lack the technical skills and resources required to effectively compete in the market will try and enter alliances to improve their capabilities, while firms keen on leveraging there existing technological capabilities will seek collaboration as a means of maximising their return on investment. However, given that my results in Table 2 reveal a consistently strong, positive association between technological orientation and performance, further investigation of the relationship between collaboration and technological orientation seems a fruitful avenue for extending research examining collaboration.

This exploratory, *post hoc* analysis has several limitations. Given the nature of my data, the analysis presents associations only, the causal direction of the relationships is not established. While several of the mediators explored in this analysis could have been tested in the reverse order, theory and logical temporal ordering directed the proposed paths. Obviously, it would be more appropriate to test the paths discussed simultaneously through a structural equation modelling (SEM) technique. However, the ratio of sample size to the number of free parameters for my study is not adequate to test such a model. Future research using SEM could empirically examine the proposed relationships discussed in the *post hoc* analysis section.

Environmental Conditions

Technological Turbulence. The results of the regression show a consistent yet unusual result with respect to the technological turbulence variable: when first entered into the model with the other environmental variables it had no significant effect in the model. However, when the set of strategic orientation variables was also included in the model, technological turbulence had a significant negative effect on performance, as proposed by H_{5b}. At a statistical level, this can be explained by the fact that technological turbulence

and technological orientation are highly correlated (ρ=.51, p=.00). Intuitively, this makes sense, as you would expect more technically turbulent environments to require firms to be more focused on developing a technology orientation to insure their survival in a rapidly changing technological environment. However, testing for mediating effects resulted in rejecting both technological turbulence and technological orientation as mediating variables.

Degree of Internationalisation. For the model with future position as the dependent variable, degree of internationalisation was positively related to performance, a result that was not explicitly hypothesised. However, this result is intuitively logically, particularly given the items that made up the measure of future position, which was perceptual in nature (product service changes; new product/service development; success of new products/services, and; diversification into new products/markets). A greater demand for internationalisation is likely to result in greater pressure to develop new products and services, and diversify into overseas markets relative to firms in markets that are predominantly domestic in focus. However, the argument for both these results breaks down upon further examination of the performance measures used in my analysis.

In trying to analyse these curious results, I realised that the method I used for examining the relationship between the environment and performance was inherently flawed. Following the research methods of several authors (e.g., Pelham 1999), my analysis investigated the link between perceptions of the environment and relative measures of performance (i.e., performance relative to competitors in the same industry). In cross-industry studies, environmental variables might influence purely objective measures of performance, but not subjective measures that are relative to others in the industry because the environmental factors should influence all firms in the industry. In such analyses, any variance in performance explained by the environment must be due to measurement error, rather than true variation and therefore any relationship must be spurious.[22] Researchers investigating the link between the environment and performance should ensure they have

[22] This argument only holds for examining the direct effects of the environment; examining the effects of interactions between environmental variables and firm-specific characteristics such as collaboration or strategic orientation on relative performance measures is appropriate, given that these firm-level characteristics will differ *within* industries.

the appropriate performance data to examine these relationships.[23]

Strategic Orientation

My results support H_{8a}, which predicted a positive association between customer orientation and firm performance. Table 3 indicates that customer orientation is associated with three of the four performance measure: future position, profitability, and overall performance score. Within the market orientation literature, customer orientation is one of three components combined to form the market orientation construct (Slater and Narver 1994). Thus, while direct comparison between customer orientation and market orientation is inappropriate, the underlying similarity of these two constructs merits comparing my findings with those in the market orientation literature. My findings for customer orientation are consistent with previous empirical studies that suggest a positive relation between market orientation and managers' perceptions of overall firm performance (Jaworski and Kohli 1993), and manager's perceptions of financial performance (Pelham 1999; Slater and Narver 1994).

Strong support was also found for H_{8c}; as Table 3 reported, technological orientation was positively related to all four performance measures. Indeed, of any of the independent variables, technological orientation has the most consistent and influential impact on performance. This result reinforces the findings of Gatignon and Xuereb (1997) who found a positive association between perceived innovation success and technological orientation. Moreover, in finding similar results to their study across different performance measures, it extends the boundary conditions of the strategic orientation-performance relationship.

Contrary to H_{9a}, I found that collaborative orientation had a negative effect on three of the four performance measures (profitability, future position and overall performance score). As I mentioned in the Methodology Section, my final measure for collaborative orientation could best be described as measuring managers' perceptions about the benefits of collaborating. One possible explanation for this negative association is that managers'

[23] Technological turbulence was kept in my model for three of the performance measures (performance score, profit, and growth/sales) because its coefficient was consistently significant and in the expected direction. More importantly, it did not significantly affect the estimates of the coefficients for the remaining variables in

unwavering faith in the virtues of collaboration could be detrimental if it is at the expense of continual evaluation of and improvement in independent approaches. Firms with managers with high collaborative orientations may be overly reliant on external organisations as mechanisms for improving competitive position and less focused on maintaining the independent strength of the firm through internal efforts. By focusing excessively on other firms, these managers could be atrophying their firm's resources and capabilities. Given that it appears that firms that perform consistently well in their industries do so by maintaining independent strength while also interacting and forming relationships with other firms, it could be worthwhile investigating the two orientations (independent and collaborative) simultaneously to determine whether a high collaborative orientation has a negative impact on performance when it coexists in a firm with a strong independent focus. If the two orientations are counter-balanced, then it would be less likely that a high collaborative orientation would impact performance negatively. Thus, rather than the absolute level of collaborative orientation affecting performance, it could be the relative emphasis among collaborative and independent approaches that influences performance.

As I have mentioned, my measure for collaborative orientation did not capture the essence of what I had hoped the collaborative orientation construct would measure; a holistic construct encapsulating not only the willingness to view other firms as valuable sources of information, business and resources but also, the will and ability to act upon these views. On reflection, the items used to measure this construct did not capture this latter aspect - the will and ability of firms to act in a collaborative manner. A more rigorous measurement development procedure is necessary to adequately address this issue. With the number of collaborative linkages and networks in the business environment continually rising, it seems appropriate to develop and refine a construct that captures an organisation's orientation to an increasingly important element of the environment.

The measures for strategic orientation were perceptual in nature and there is the risk that respondents' views did not accurately reflect their firms' true position, thereby biasing results. However, respondents were generally the managing director or owner of the firm,

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the equation.

and are likely to be in the best position to comment on the firm's strategy and performance (McKendall and Wagner 1997). As a validation procedure, it would be recommended that future research use multiple respondents to the level of convergence in results across respondents. The measures for the strategic orientation and environmental variables were collected in the second stage of the survey, and asked respondents to indicate their firm's current environmental conditions and orientation. Thus, any significant relationships among these variables or with these variables and the performance measures also must be treated as strictly associative.

Managerial Implications

Although the current findings are subject to verification and refinement, they offer several insights for managers. My results suggest that collaboration is not associated with higher firm performance levels. Managers should not think of collaborative business relationships as a panacea by which they can overcome all of their firm's deficiencies and achieve competitive advantage. My results indicate that collaboration is not necessarily valuable for all firms or in all circumstances, indeed, internal and external conditions may dictate whether or not collaborating is an appropriate strategy. However, while collaboration does not necessarily result in high performance, the jury is still out on whether or not collaboration can *improve* performance. Through collaboration, small and medium-sized firms (which this research predominately focused on) may be able to improve their relative performance. My results suggest that firms in want of collaboration appear to perform worse than firms involved in either marketing-only or combined marketing and development collaborative relationships. My results also suggest that while these two types of collaborative activity are worthwhile, other forms of interfirm collaboration may actually be detrimental to a firm's performance. Out-licensing, manufacturing agreements, and agreements lacking a clear focus with respect to the role collaborative activity played, were negatively associated with performance. Managers need to have clear goals related to their cooperative activity, while also ensuring that they do not cede or diminish their firm's capabilities in specific areas through excessive reliance on outside organisations. Managers should not be lead astray by the current overwhelming popularity of collaboration. Practitioners should evaluate the environment, organisations to be involved and the financial and information costs associated with collaborating before entering any cooperative activity.

The findings suggest that many firms that would like to collaborate are unable to do so. Given that these firms performed worse than collaborating firms, managers may want to consider the constraints inhibiting their firm from collaborating. While some reasons such as poor performance or inadequate resources may be more difficult to overcome, other constraints could be managed to enhance the likelihood that the firm could become involved in cooperation in the future. Established norms or organisational policies, which many managers in this sample indicated prohibited collaboration, may need to be re-evaluated. For many managers, particularly those of small firms, cooperating can bring substantial tension through fear of loss of control to partner firms. These misgivings may need to be resolved to allow the firm to make the most of any cooperative opportunities that might be beneficial. Managers having difficulty in finding appropriate partners, or locked out of existing networks should ensure that they maintain contact with other firms, thereby increasing their chances of participation in future relationships. However, managers should not orient themselves too closely with other firms; my results suggest that a high collaborative orientation may have a negative influence on firm performance. My findings suggest that a balance needs to be maintained between both developing independent strength while also networking and creating constructive relationships with other firms.

Finally, the positive coefficients for both customer and technological orientation indicate that the orientation of the firm can impact performance. My results are consistent with the relationship marketing literature, which generally recommend using a customer orientation to develop and maintain strong customer relationships. The technological (or product) orientation of firms had a strong impact on all measures of performance, particularly on the future position of the firm. To maintain a competitive position in the market, firms should be proactive in their integration of technologies into new products or services, as well as in their development of new technologies and products or services. The results also suggest that the technological orientation of a firm and collaboration may be interwoven; collaboration may be one of the best methods for developing and sustaining technological leadership, while also providing a mechanism for leverage existing skills and technical know-how. Managers may benefit from investigating how they can incorporate development-oriented collaboration into their portfolio of strategic options.

Conclusion

Theoretical and managerial perspectives alike have often argued that through collaboration, firms can achieve competitive advantage over firms taking independent approaches. My thesis suggests collaboration per se does not influence performance. Rather, it indicates that the inability to collaborate may have negative performance implications for firms in want of collaboration. In terms of collaboration and performance, then, my findings suggest that it is not what you can do that matters, it is what you can't do. It also reveals that some types of collaborative activity may actually have a deleterious effect on a firm's performance. This thesis adds to the small, but growing literature that has investigated the link between performance and collaborative activity. Like its predecessors, my findings do not provide conclusive evidence as to the value of cooperation – collaboration is not necessarily valuable for all firms. Perhaps it is time to move forward from examining generalised arguments regarding collaboration's impact on performance and instead focus efforts on investigating the influence of more fine-grained categorisations of collaboration. My findings, along with those of other researchers, also suggest that while collaboration may provide the *potential* for achieving competitive advantage, it may not be sufficient. Unless managers know how to effectively use their collaborative relationships, then the mere fact that a firm is involved in such agreements is unlikely to affect performance. There are many factors relating to the structure and maintenance of interfirm relationships that may enhance or impede the performance of the relationship and hence the performance of the participating firms. Bridging the gap between the literature that focuses exclusively on firms that ally and the empirical research examining the link between collaboration and performance may prove invaluable. By incorporating this literature into research examining the relative efficacy of collaborating in achieving organisational outcomes, greater insights regarding the impact of collaboration may be uncovered. As difficult as this may be, it may be the only viable way of determining the true value of collaboration.

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Appendices

Appendix 1A:
Second-Stage Questionnaire for Collaborating Firms

Collaborative Business Relationships Survey

UNIVERSITY OF CANTERBURY
CHRISTCHURCH • NEW ZEALAND

Section A. Collaborative Agreements

The responses to the questionnaire sent out in **October 1997** indicated that at the time your firm was involved in at least one ***Contractual*** Collaborative Agreement (Contractual collaborations were defined as non-equity formal agreements between two or more firms. These included technical buybacks, licenses, strategic alliances, and management and service agreements).

The next three questions relate to the following contractual collaborative agreements your firm reported having in October 1997:

_____

_____

1. Have any of the aforementioned ***contractual*** collaborative agreements held by your firm in October 1997 subsequently been terminated?
   - ❑ Yes
   - ❑ No → Please go to Section B.

2. How many of the aforementioned agreements have been terminated? _____

3. When was/were the agreement(s) terminated? _____

Section B. Extent of Internationalisation

4. Did your firm export during the **1994** financial year?
   - ❑ Yes
   - ❑ No → Please go to Question 7.

5. How many markets (countries) did your firm export to in **1994**? _____

6. What proportion of your firm's total sales in the **1994** financial year were derived from export sales?

   _____

7. Did your firm export during the **1998** financial year?
   - ❑ Yes
   - ❑ No → Please go to Section C.

8. How many markets (countries) did your firm export to in **1998**? _____

9. What proportion of your firm's total sales in the **1998** financial year were derived from export sales?

   _____

10. Has your firm used any of its ***contractual*** collaborations to facilitate the internationalisation process between **1994** and **1998**?
    - ❑ Yes
    - ❑ No

11. If your firm exported in 1994 and 1998, what was your firm's export sales growth rate over this period?

    _____ (% growth rate).

Section C. Your Firm's Environment

12. This section contains questions designed to gain an understanding about the industry that accounts for the largest percentage of your firm's sales (in other words, your ***principal*** industry). Please circle the number that best represents your level of agreement with each statement.

		Strongly Disagree			Neither Agree nor Disagree			Strongly Agree
a.	Demand and consumer tastes are difficult to predict.....	1	2	3	4	5	6	7
b.	Our industry is extremely R&D oriented.....	1	2	3	4	5	6	7
c.	Customers' product preferences are changing rapidly.....	1	2	3	4	5	6	7
d.	Very few firms in our industry have any collaborative agreements.....	1	2	3	4	5	6	7
e.	Many firms in our industry are now looking to overseas markets to increase their sales.....	1	2	3	4	5	6	7
f.	The production and service technology in our industry is changing rapidly.....	1	2	3	4	5	6	7
g.	New customers tend to have product-related needs that are different from those of our existing customers.....	1	2	3	4	5	6	7
h.	To be successful, firms in our industry must seek to extend their sales or services outside of New Zealand.....	1	2	3	4	5	6	7
i.	The rate at which products and services are getting obsolete in the industry is very slow.....	1	2	3	4	5	6	7
j.	Customers' product preferences have become far more predictable in the last 2 years.....	1	2	3	4	5	6	7
k.	A large number of new product ideas have been made possible through technological breakthroughs in our industry.....	1	2	3	4	5	6	7
l.	To be successful, firms in our industry must seek to expand their sales or services into new regions.....	1	2	3	4	5	6	7
m.	Technology changes provide big opportunities in our industry.....	1	2	3	4	5	6	7
n.	We are witnessing demand for our products and services from customers who have never bought them before.....	1	2	3	4	5	6	7
o.	In our industry, collaborative agreements among firms have become widespread.....	1	2	3	4	5	6	7
p.	Market niches exist which allow firms to concentrate solely on the domestic market.....	1	2	3	4	5	6	7
q.	Technological developments in our industry are rather minor.....	1	2	3	4	5	6	7
r.	The level of cooperation among competing firms in our industry is very low.....	1	2	3	4	5	6	7
s.	The technology used in our industry is sourced from a number of different industries and fields.....	1	2	3	4	5	6	7
t.	Our company must rarely change its marketing practices to keep up with new or existing customers.....	1	2	3	4	5	6	7
u.	Networks of cooperating firms are becoming increasingly prevalent in our industry.....	1	2	3	4	5	6	7
v.	Technologically, our industry is very sophisticated and complex.....	1	2	3	4	5	6	7
w.	Firms in our industry cannot survive by relying solely on the New Zealand market.....	1	2	3	4	5	6	7
x.	There has been a dramatic increase in the number of contractual collaborations in our industry.....	1	2	3	4	5	6	7
y.	Growth opportunities in our industry require investigating entry into overseas markets.....	1	2	3	4	5	6	7

Section D. Your Firm's Orientation

13. For each of the following statements, please circle the number that most closely describes your organisation or the beliefs held by top management.

		Strongly Disagree			Neither Agree nor Disagree			Strongly Agree
a.	We pay close attention to after-sales service.....	1	2	3	4	5	6	7
b.	We respond rapidly to competitive actions.....	1	2	3	4	5	6	7
c.	We frequently measure customer satisfaction.....	1	2	3	4	5	6	7
d.	Firms that collaborate expose themselves to risk.....	1	2	3	4	5	6	7
e.	We strive to maintain a high level of commitment in serving customers' needs.....	1	2	3	4	5	6	7
f.	In our organisation, salespeople share competitive information.....	1	2	3	4	5	6	7
g.	Collaborating with other firms provides a mechanism for developing mutually advantageous benefits.....	1	2	3	4	5	6	7
h.	We exploit every opportunity that allows us to gain a competitive advantage over other firms in our industry...	1	2	3	4	5	6	7
i.	Our firm rapidly integrates new technologies into our product/service offerings.....	1	2	3	4	5	6	7
j.	Competitors can be used to enhance a firm's capabilities.....	1	2	3	4	5	6	7
k.	Our competitive advantage is based on thoroughly understanding customers' needs.....	1	2	3	4	5	6	7
l.	Our firm is very seldom the first business to introduce new products/services.....	1	2	3	4	5	6	7
m.	Other firms in our industry are important sources of information and resources for our firm.....	1	2	3	4	5	6	7
n.	Collaborative activities should only be used for short-term gain.....	1	2	3	4	5	6	7
o.	Our new products/services always incorporate state-of-the-art technology.....	1	2	3	4	5	6	7
p.	By working together, firms in our industry can make the industry more profitable for everyone involved.....	1	2	3	4	5	6	7
q.	Our firm uses sophisticated technologies in its new product/service development.....	1	2	3	4	5	6	7
r.	Business strategies are driven by the goal of increasing customer value.....	1	2	3	4	5	6	7
s.	Cooperating with other firms provides a mechanism for improving a firm's capabilities.....	1	2	3	4	5	6	7
t.	Our firm proactively develops new operating and product technologies.....	1	2	3	4	5	6	7
u.	At our firm, we take a proactive stance in generating new product/service ideas.....	1	2	3	4	5	6	7
v.	Our business objectives are driven by customer satisfaction.....	1	2	3	4	5	6	7
w.	Top management regularly discusses competitors' strengths and weaknesses.....	1	2	3	4	5	6	7
x.	With so many firms now collaborating, it seems like the right thing for firms to do.....	1	2	3	4	5	6	7

Section E. Performance Criteria

The purpose of this section is to compare YOUR firm relative to your firm's major competitors.

14. Please indicate the degree of **importance** YOUR firm attaches to each of the following financial performance criteria:

	Less Important to us			Equal to Competition			More Important to us
a. Sales growth rate	1	2	3	4	5	6	7
b. Return on investment	1	2	3	4	5	6	7
c. Product/service changes	1	2	3	4	5	6	7
d. Cash flow	1	2	3	4	5	6	7
e. New product/service development	1	2	3	4	5	6	7
f. Gross profit margin	1	2	3	4	5	6	7
g. Net profit from operations	1	2	3	4	5	6	7
h. Success of new products/services	1	2	3	4	5	6	7
i. Level of sales revenue	1	2	3	4	5	6	7
j. Diversification into new products/markets	1	2	3	4	5	6	7
k. Relative market share	1	2	3	4	5	6	7

15. For each of the following items, please circle the number that best reflects how *YOUR FIRM* **performed** compared to other firms in your principal industry in the **1998** financial year (**note**, for items reflecting growth measures, please use the period **1994** to **1998**).

Characteristics	*Performance Level*						
	Much worse than Competition			Equal to Competition			Much better than the Competition
a. Sales Growth (1994-1998)	1	2	3	4	5	6	7
b. Net Income Growth (1994-1998)	1	2	3	4	5	6	7
c. Return on Investment	1	2	3	4	5	6	7
d. Product/service changes	1	2	3	4	5	6	7
e. Cash flow	1	2	3	4	5	6	7
f. New product/service development	1	2	3	4	5	6	7
g. Gross profit margin	1	2	3	4	5	6	7
h. Net profit from operations	1	2	3	4	5	6	7
i. Success of new products/services	1	2	3	4	5	6	7
j. Level of sales revenue	1	2	3	4	5	6	7
k. Diversification into new products/markets	1	2	3	4	5	6	7
l. Relative market share	1	2	3	4	5	6	7

16. To complete our analysis, we would appreciate it if you could provide the following financial details. We would like to remind you that this questionnaire is confidential, and only the aggregated results will be used for academic research.

a. 1998 **Domestic** Gross Sales ($) _____

b. 1998 **Export** Gross Sales ($) _____

c. 1998 Net Income after Taxes ($) _____

d. 1998 Return on Investment (%) _____

e. 1994 **Domestic** Gross Sales _____

f. 1994 **Export** Gross Sales ($) _____

g. 1994 Net Income after Taxes ($) _____

Thank you, the survey is completed.

Please return the completed questionnaire using the Freepost envelope provided.

Appendix 1B:
Second-Stage Questionnaire for Non-Collaborating Firms

Collaborative Business Relationships Survey

UNIVERSITY OF CANTERBURY
CHRISTCHURCH • NEW ZEALAND

Section A. Collaboration

The responses to the questionnaire sent out in **October 1997** indicated that at the time your firm was not involved in any Collaborative Agreements (A "Collaborative Agreement" was broadly defined as those inter-firm relationships: having strategic goals which are defined by all parties in the relationship; which are long-term in nature as opposed to one-off agreements; and involve mutual effort and shared control).

For the following questions, please indicate with a tick (✓) any statements that apply to your firm.

1. Why was your firm not involved in any Collaborative Agreements in October 1997?
   - ❑ We had a company policy not to collaborate with any other firms.
   - ❑ The environmental context was not conducive to cooperating.
   - ❑ Our company policy was not to collaborate with our competitors.
   - ❑ Our firm lacked the resources (money, human resources, managerial time, or excess capacity) to enter into any collaborative agreements.
   - ❑ We didn't perceive that there was anything to be gained from collaborating.
   - ❑ We had concerns about the legal implications of collaborating.
   - ❑ It was difficult to assess the potential benefits to be gained from collaborating.
   - ❑ We were concerned about divulging confidential information via a collaborative relationship.
   - ❑ We could not find any appropriate partners, specifically:
     - ❑ There were no firms with complementary skills and resources available.
     - ❑ We could not find a firm willing to collaborate.
   - ❑ Other (please explain)

2. Has your firm entered into any Collaborative Agreements since October 1997?
   - ❑ Yes
   - ❑ No

Section B. Extent of Internationalisation

3. Did your firm export during the **1994** financial year?
   - ❑ Yes
   - ❑ No → Please go to Question 6.

4. How many markets (countries) did your firm export to in **1994**? _____

5. What proportion of your firm's total sales in the **1994** financial year were derived from export sales?

   _____

6. Did your firm export during the **1998** financial year?
   - ❑ Yes
   - ❑ No → Please go to Section C.

7. How many markets (countries) did your firm export to in **1998**? _____

8. What proportion of your firm's total sales in the **1998** financial year were derived from export sales?

   _____

9. If your firm exported in 1994 and 1998, what was your firm's export sales growth rate over this period?

   _____ (% growth rate).

Section C. Your Firm's Environment

13. This section contains questions designed to gain an understanding about the industry that accounts for the largest percentage of your firm's sales (in other words, your ***principal*** industry). Please circle the number that best represents your level of agreement with each statement.

		Strongly Disagree			Neither Agree nor Disagree			Strongly Agree
a.	Demand and consumer tastes are difficult to predict.....	1	2	3	4	5	6	7
b.	Our industry is extremely R&D oriented.....	1	2	3	4	5	6	7
c.	Customers' product preferences are changing rapidly.....	1	2	3	4	5	6	7
d.	Very few firms in our industry have any collaborative agreements.....	1	2	3	4	5	6	7
e.	Many firms in our industry are now looking to overseas markets to increase their sales.....	1	2	3	4	5	6	7
f.	The production and service technology in our industry is changing rapidly.....	1	2	3	4	5	6	7
g.	New customers tend to have product-related needs that are different from those of our existing customers.....	1	2	3	4	5	6	7
h.	To be successful, firms in our industry must seek to extend their sales or services outside of New Zealand.....	1	2	3	4	5	6	7
i.	The rate at which products and services are getting obsolete in the industry is very slow.....	1	2	3	4	5	6	7
j.	Customers' product preferences have become far more predictable in the last 2 years.....	1	2	3	4	5	6	7
k.	A large number of new product ideas have been made possible through technological breakthroughs in our industry.....	1	2	3	4	5	6	7
l.	To be successful, firms in our industry must seek to expand their sales or services into new regions.....	1	2	3	4	5	6	7
m.	Technology changes provide big opportunities in our industry.....	1	2	3	4	5	6	7
n.	We are witnessing demand for our products and services from customers who have never bought them before.....	1	2	3	4	5	6	7
o.	In our industry, collaborative agreements among firms have become widespread.....	1	2	3	4	5	6	7
p.	Market niches exist which allow firms to concentrate solely on the domestic market.....	1	2	3	4	5	6	7
q.	Technological developments in our industry are rather minor.....	1	2	3	4	5	6	7
r.	The level of cooperation among competing firms in our industry is very low.....	1	2	3	4	5	6	7
s.	The technology used in our industry is sourced from a number of different industries and fields.....	1	2	3	4	5	6	7
t.	Our company must rarely change its marketing practices to keep up with new or existing customers.....	1	2	3	4	5	6	7
u.	Networks of cooperating firms are becoming increasingly prevalent in our industry.....	1	2	3	4	5	6	7
v.	Technologically, our industry is very sophisticated and complex.....	1	2	3	4	5	6	7
w.	Firms in our industry cannot survive by relying solely on the New Zealand market.....	1	2	3	4	5	6	7
x.	There has been a dramatic increase in the number of contractual collaborations in our industry.....	1	2	3	4	5	6	7
y.	Growth opportunities in our industry require investigating entry into overseas markets.....	1	2	3	4	5	6	7

Section D. Your Firm's Orientation

14. For each of the following statements, please circle the number that most closely describes your organisation or the beliefs held by top management.

		Strongly Disagree			Neither Agree nor Disagree			Strongly Agree
a.	We pay close attention to after-sales service.....	1	2	3	4	5	6	7
b.	We respond rapidly to competitive actions.....	1	2	3	4	5	6	7
c.	We frequently measure customer satisfaction.....	1	2	3	4	5	6	7
d.	Firms that collaborate expose themselves to risk.....	1	2	3	4	5	6	7
e.	We strive to maintain a high level of commitment in serving customers' needs.....	1	2	3	4	5	6	7
f.	In our organisation, salespeople share competitive information.....	1	2	3	4	5	6	7
g.	Collaborating with other firms provides a mechanism for developing mutually advantageous benefits.....	1	2	3	4	5	6	7
h.	We exploit every opportunity that allows us to gain a competitive advantage over other firms in our industry...	1	2	3	4	5	6	7
i.	Our firm rapidly integrates new technologies into our product/service offerings.....	1	2	3	4	5	6	7
j.	Competitors can be used to enhance a firm's capabilities.....	1	2	3	4	5	6	7
k.	Our competitive advantage is based on thoroughly understanding customers' needs.....	1	2	3	4	5	6	7
l.	Our firm is very seldom the first business to introduce new products/services.....	1	2	3	4	5	6	7
m.	Other firms in our industry are important sources of information and resources for our firm.....	1	2	3	4	5	6	7
n.	Collaborative activities should only be used for short-term gain.....	1	2	3	4	5	6	7
o.	Our new products/services always incorporate state-of-the-art technology.....	1	2	3	4	5	6	7
p.	By working together, firms in our industry can make the industry more profitable for everyone involved.....	1	2	3	4	5	6	7
q.	Our firm uses sophisticated technologies in its new product/service development.....	1	2	3	4	5	6	7
r.	Business strategies are driven by the goal of increasing customer value.....	1	2	3	4	5	6	7
s.	Cooperating with other firms provides a mechanism for improving a firm's capabilities.....	1	2	3	4	5	6	7
t.	Our firm proactively develops new operating and product technologies.....	1	2	3	4	5	6	7
u.	At our firm, we take a proactive stance in generating new product/service ideas.....	1	2	3	4	5	6	7
v.	Our business objectives are driven by customer satisfaction.....	1	2	3	4	5	6	7
w.	Top management regularly discusses competitors' strengths and weaknesses.....	1	2	3	4	5	6	7
x.	With so many firms now collaborating, it seems like the right thing for firms to do.....	1	2	3	4	5	6	7

Section E. Performance Criteria

The purpose of this section is to compare YOUR firm relative to your firm's major competitors.

17. Please indicate the degree of **importance** YOUR firm attaches to each of the following financial performance criteria:

	Less Important to us			Equal to Competition			More Important to us
l. Sales growth rate	1	2	3	4	5	6	7
m. Return on investment	1	2	3	4	5	6	7
n. Product/service changes	1	2	3	4	5	6	7
o. Cash flow	1	2	3	4	5	6	7
p. New product/service development	1	2	3	4	5	6	7
q. Gross profit margin	1	2	3	4	5	6	7
r. Net profit from operations	1	2	3	4	5	6	7
s. Success of new products/services	1	2	3	4	5	6	7
t. Level of sales revenue	1	2	3	4	5	6	7
u. Diversification into new products/markets	1	2	3	4	5	6	7
v. Relative market share	1	2	3	4	5	6	7

18. For each of the following items, please circle the number that best reflects how *YOUR FIRM* **performed** compared to other firms in your principal industry in the **1998** financial year (**note**, for items reflecting growth measures, please use the period **1994** to **1998**).

Characteristics	*Performance Level*						
	Much worse than Competition			Equal to Competition			Much better than the Competition
m. Sales Growth (1994-1998)	1	2	3	4	5	6	7
n. Net Income Growth (1994-1998)	1	2	3	4	5	6	7
o. Return on Investment	1	2	3	4	5	6	7
p. Product/service changes	1	2	3	4	5	6	7
q. Cash flow	1	2	3	4	5	6	7
r. New product/service development	1	2	3	4	5	6	7
s. Gross profit margin	1	2	3	4	5	6	7
t. Net profit from operations	1	2	3	4	5	6	7
u. Success of new products/services	1	2	3	4	5	6	7
v. Level of sales revenue	1	2	3	4	5	6	7
w. Diversification into new products/markets	1	2	3	4	5	6	7
x. Relative market share	1	2	3	4	5	6	7

19. To complete our analysis, we would appreciate it if you could provide the following financial details. We would like to remind you that this questionnaire is confidential, and only the aggregated results will be used for academic research.

h. 1998 **Domestic** Gross Sales ($) _____

i. 1998 **Export** Gross Sales ($) _____

j. 1998 Net Income after Taxes ($) _____

k. 1998 Return on Investment (%) _____

l. 1994 **Domestic** Gross Sales _____

m. 1994 **Export** Gross Sales ($) _____

n. 1994 Net Income after Taxes ($) _____

Thank you, the survey is completed.

Please return the completed questionnaire using the Freepost envelope provided.

Appendix 2:
First-Stage Questionnaire for All Firms

Mary Ellen Gordon
Department of Management
University of Canterbury Private Bag 4800
Christchurch New Zealand
Telephone: 03-364 2606
Fax: 03-364 2020

Please return to:
Freepost 91819
University of Canterbury Survey
PO Box 30-485
Lower Hutt

16 October 1997

The Department of Management at the University of Canterbury is conducting a nationwide survey of collaborative agreements. We sent you a copy of this survey previously, but are now sending another because we have not yet received your reply. The purpose of the research is to understand the extent and nature of the collaborative activities undertaken by New Zealand firms. This research will provide a foundation for the development of New Zealand's first Centre of Collaborative Business Studies - a specialised academic research unit at the University.

This questionnaire is confidential, and only the aggregated results will be used for academic research. An overview of the findings will be sent to all those companies who have participated in the research. Additionally, all questionnaires completed and returned will be entered into a draw to win a gift voucher for an Ansett Mystery Weekend for two.

There are two sections to this questionnaire:
the first is a brief summary of your company,
the second reviews the basic elements of your collaborative agreements.

Please complete this first section and return it using the Free-Post address below, while distributing the second section to those managers who have direct responsibility for a collaborative agreement within your firm. If there is more than one collaboration, please photocopy the second section - each photocopy will be separately eligible for the Mystery Weekend. There is a Free-Post address attached to the second portion for the manager to send it to us directly. Your answers are being scanned and it would be appreciated if any photocopies are of good quality.

A "Collaborative Agreement" is broadly defined as those inter-firm relationships: having strategic goals which are defined by all parties in the relationship. which are long-term in nature as opposed to one-off agreements. involving mutual effort and shared control. Further examples of collaborative agreements are stated in question 5 over the page.

If you have no collaborative agreements or have a company policy of not participating in research, please cross the boxes provided over the page and you will still be eligible for a summary of the results and the Ansett Mystery Weekend.

Thank you for your participation.

Mary Ellen Gordon

Mary Ellen Gordon, Ph.D.
Lecturer, University of Canterbury.

Please indicate with a Cross (X) if you have no "Collaborative Agreements": ☐

Please indicate with a cross if you have a company policy of not participating in research: ☐

If so... simply return this page using the Free-Post address below and still be eligible for the Ansett Mystery Weekend.

Please confirm that our address details are correct:

Company Name:
Address:

Contact:
Phone: Fax:

1. What year was your company founded:

2. What is your company's core business:

3. Please indicate with a Cross (X) the box that best represents the current total number of employees at your firm:

1-10	☐
11-20	☐
21-50	☐
51-99	☐
100+	☐

4. Please indicate with a Cross (X) which category best describes your company's (Consolidated) Annual Sales

less than $100,000	☐
at least $100,000 - but less than $0.5 million	☐
at least $0.5 million - but less than $1.0 million	☐
at least $1.0 million - but less than $10.0 million	☐
greater than $10.0 million	☐

How many collaborative agreements is your firm currently involved in ? - These may include: Joint ventures, technical buybacks, licenses, strategic alliances, management & service agreements, and informal long-term cooperative agreements. Excluded from this definition are single transaction or short-term relationships, technology purchase agreements, relationships not considered strategic by at least one participant, internal relationships between organisations that share majority ownership, state supported research and development programs, relationships participated in due to lack of choice (ie. franchises or the Kiwi Fruit Marketing Board etc.), and relationships with non-profit or government institutions. Your Answer:

This is the end of the first section. Please return it to: "Freepost 91819, University of Canterbury Survey, PO Box 30-485, Lower Hutt."

Please forward the remainder of the questionnaire to those managers who are actively responsible for each of your firm's collaborative agreements.

Thank You.

Mary Ellen Gordon
Department of Management
University of Canterbury Private Bag 4800
Christchurch New Zealand
Telephone: 03-364 2606
Fax: 03-364 2020

Please return to:
Freepost 91819
University of Canterbury Survey
PO Box 30-485
Lower Hutt

Dear Sir/Madam,

This letter has been forwarded to you as part of a survey of your firm. You have been identified as a manger who is actively involved with a collaborative relationship between your firm and another firm. The Department of Management at the University of Canterbury is studying the characteristics of collaborative relationships involving New Zealand firms. The purpose of this questionnaire is to seek your opinion regarding a specific collaborative relationship which you are actively involved in. The survey does not require you to reveal confidential information and the results will be aggregated to disguise your response. The survey has been designed to be very quickly answered. Usually a simple cross to indicate your response. Your company will receive a summary of results, and you will be personally entered into a draw to win an Ansett Mystery Weekend gift voucher for two.

Thank you for your participation,

Mary Ellen Gordon,Ph.D.
Lecturer.

1. Your Name: _____
2. Your title within the company: _____
3. Your contact phone number: _____
4. Do you have a name for this collaborative agreement (eg. ANZUS) ? :

   _____
5. What firms, besides your own, are involved in this collaborative agreement ? :

   _____
6. Please indicate with a cross(X) all activities involved in the relationship:

	Your firm:	Other firms:
R&D	☐	☐
Manufacturing	☐	☐
Marketing	☐	☐
Distribution	☐	☐
Sales	☐	☐
After-Sales-Service	☐	☐

7. Please indicate with a Cross (X) the Country of Origin of your partner firm(s) and all countries which the collaborative relationship is active:

	Partner's country		*Collaborative relationship location*
Australia	☐		☐
Asia	☐	please specify: _____	☐
USA	☐		☐
Mexico, Central & Sth. America	☐	please specify: _____	☐
Canada	☐	please specify: _____	☐
UK & Ireland	☐		☐
E.C. Europe (except UK & Ir.)	☐	please specify: _____	☐
Eastern Europe	☐	please specify: _____	☐
African Continent	☐	please specify: _____	☐
Middle East	☐	please specify: _____	☐
Pacific Islands	☐	please specify: _____	☐
New Zealand	☐		☐

8. Please indicate with a Cross (X) which of the alternatives listed below best describes your collaborative relationship:

☐ *Go to Q.9* **A Joint Venture:** involves the establishment of a separate legal entity in which equity is shared by both parents. joint Ventures provide joint, but not necessarily equal, degrees of ownership and control over the use and benefit of assets.

☐ *Go to Q.10* **Contractual collaborations:** are non-equity formal agreements between two or more firms. these include technical buybacks, licenses, strategic alliances, and management and service agreements.

☐ *Go to Q.10* **Informal agreements:** involve a non-contractual cooperative association between two or more firms.

9. If the form of collaborative relationship specified above was a Joint Venture, did this involve the formation of a:

Please indicate your response with a Cross (X) in the box provided

Limited liability private company	☐
Unlimited liability private company	☐
Public company	☐
Partnership	☐
Other	☐

10. In what year did the initial negotiation of the agreement begin ?

☐ Date:

☐ Unknown

11. In what year was the agreement formally instituted ?

☐ Date:

☐ Unknown

12. Is there an agreed termination date for the relationship ?

☐ No

☐ Yes, Date:

☐ Yes, Unknown

13. Please indicate with a Cross (X) the relative strategic importance of the collaborative relationship to you and your partners:

	Your firm:	Other firms:
Not important	☐	☐
Moderately important	☐	☐
Very important	☐	☐

14. Which, if any, forms of Government assistance have been provided to create or support this relationship (please cross all that apply):

☐ None

☐ Hard Networks

☐ Joint Action Groups

☐ Business Development Grant

☐ Trade Development

☐ Other please specify: _____

15. Please indicate with a Cross (X) which of the sectors listed below best describes the activities involved in the relationship:

☐ Agricultural Services, Forestry & Fishing please specify: _____

☐ Mining and Quarrying please specify: _____

☐ Manufacturing please specify: _____

☐ Electricity, Gas & Water please specify: _____

☐ Construction please specify: _____

☐ Wholesale & Retail trade, Restaurants & Hotels please specify: _____

☐ Transportation, Storage & Communication please specify: _____

☐ Business & Financial Services please specify: _____

☐ Community, Social & Personal Services please specify: _____

16. Please indicate with a Cross (X) the category which best represents this relationship:

☐ All Partners provide similar inputs:

if so...

☐ in areas each is familiar with

☐ in areas one is familiar with

☐ in areas new to all partners

☐ Most inputs are provided by only one partner:

if so...

☐ the partner providing the input is thoroughly familiar with the area

☐ the partner providing the input is somewhat familiar with the area

☐ the partner providing the input is unfamiliar with the area

17. Please rate the quality of the relationship between your firm and other partners ?
Please indicate your response with a Cross (X) in the box provided

Above Average ☐

Average ☐

Below Average ☐

18. To what degree does the relationship involve the use of technology ?
Please indicate your response with a Cross (X) in the box provided

High use of technology ☐

Some use of technology ☐

Little/no use of technology ☐

19. Overall, how has this relationship been for your firm ?
Please indicate your response with a Cross (X) in the box provided

Exceeded expectations ☐

Met expectations ☐

Has not lived up to expectations ☐

Thank you, the survey is completed.

Please return the completed survey using the Free-Post Address below:

Freepost 91819
University of Canterbury Survey
PO Box 30-485
Lower Hutt

Good luck for the Ansett Mystery Weekend.

Appendix 3:

Descriptives, Correlations, Factor Analysis and Reliabilities for Environmental, Strategic Orientation and Performance Measures

TABLE A1
Descriptive Statistics

Measurement	Mean	Standard Deviation
Firm age	32.54	33.04
Degree of internationalisation	3.92	1.45
Technological turbulence	4.40	1.28
Industry-level collaboration	3.23	1.25
Customer orientation	5.59	0.79
Collaborative orientation	4.47	1.10
Technological orientation	4.74	1.03
Performance Score	4.96	1.40
Growth/share performance	5.07	1.26
Profit performance	4.86	1.22
Future position	4.99	1.10

Notes: All measures, apart from firm age, have a range of 1-7.

TABLE A2
Correlation Matrix for Constructs

Correlations

		AGE Firm Age	INTER Degree of Internationalisation	TECH Technological Turbulence	INDCOLAB Industry-Level Collaboration	CUST Customer Orientation	SOCOLLAB Collaborative Orientation	TECHNOLO Technological Orientation	PERFSCOR Performance Score	SALES Sales Performance	PROFIT Profit Performance	FUTURE Future Position
AGE Firm Age	Pearson Correlation											
	Sig. (2-tailed)											
	N											
INTER Degree of Internationalisation	Pearson Correlation	.051										
	Sig. (2-tailed)	.635										
	N	89										
TECH Technological Turbulence	Pearson Correlation	-.031	.202*									
	Sig. (2-tailed)	.771	.033									
	N	89	111									
INDCOLAB Industry-Level Collaboration	Pearson Correlation	.013	.154	.324**								
	Sig. (2-tailed)	.905	.107	.001								
	N	89	111	111								
CUST Customer Orientation	Pearson Correlation	-.264*	.111	.149	.044							
	Sig. (2-tailed)	.013	.250	.120	.650							
	N	88	110	110	110							
SOCOLLAB Collaborative Orientation	Pearson Correlation	.163	.220*	.306**	.362**	.159						
	Sig. (2-tailed)	.130	.021	.001	.000	.097						
	N	88	110	110	110	110						
TECHNOLO Technological Orientation	Pearson Correlation	-.239*	.250**	.508**	.102	.412**	.128					
	Sig. (2-tailed)	.025	.008	.000	.289	.000	.181					
	N	88	110	110	110	110	110					
PERFSCOR Performance Score	Pearson Correlation	-.172	.028	.008	-.007	.364**	-.137	.410**				
	Sig. (2-tailed)	.152	.791	.944	.951	.000	.199	.000				
	N	71	89	89	89	89	89	89				
SALES Sales Performance	Pearson Correlation	-.117	.045	-.090	-.078	.261*	-.162	.272**	.872**			
	Sig. (2-tailed)	.324	.672	.390	.459	.011	.120	.008	.000			
	N	73	93	93	93	93	93	93	89			
PROFIT Profit Performance	Pearson Correlation	-.176	-.075	-.053	-.056	.325**	-.210*	.265*	.880**	.732**		
	Sig. (2-tailed)	.139	.479	.613	.594	.002	.045	.011	.000	.000		
	N	72	92	92	92	92	92	92	89	92		
FUTURE Future Position	Pearson Correlation	-.127	.248*	.202	.054	.430**	-.032	.578**	.814**	.653**	.526**	
	Sig. (2-tailed)	.283	.016	.052	.605	.000	.762	.000	.000	.000	.000	
	N	73	93	93	93	93	93	93	89	92	92	

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

TABLE A3
Four-Factor Solution with Varimax Rotation for Environmental Items

	F1	F2	F3	F4
Degree of Internationalisation				
Many firms in our industry are now looking to overseas markets to increase their sales.	**.71**	.08	.02	.03
To be successful, firms in our industry must seek to extend their sales or services outside of New Zealand.	**.87**	.07	.05	.14
To be successful, firms in our industry must seek to expand their sales or services into new regions.	**.61**	.20	-.07	.22
Market niches exist which allow firms to concentrate solely on the domestic market.	**.56**	-.02	.12	-.16
Firms in our industry cannot survive by relying solely on the New Zealand.	**.80**	.10	.14	.08
Growth opportunities in our industry require investigating entry into overseas markets.	**.83**	.08	.10	-.04
Technological Turbulence				
Our industry is extremely R&D oriented.	.19	**.41**	.08	**.43**
A large number of new product ideas have been made possible through technological breakthroughs in our industry.	.09	**.80**	.19	-.02
Technology changes provide big opportunities in our industry.	-.03	**.65**	.11	.11
Technological developments in our industry are rather minor. [R]	-.01	**.79**	.13	.04
Technologically, our industry is very sophisticated and complex.	.08	**.67**	.06	.02
The production and service technology in our industry is changing rapidly. ★	.14	**.59**	.16	.20
The rate at which products and services are getting obsolete in the industry is very slow. [R] ★				
Industry-level Collaboration				
Very few firms in our industry have any collaborative relationships. [R]	-.04	.22	**.65**	-.08
In our industry, collaborative agreements among firms have become widespread.	.06	.14	**.74**	.08
Networks of cooperating firms are becoming increasingly prevalent in our industry.	.08	.18	**.77**	-.04
There has been a dramatic increase in the number of contractual collaborations in our industry.	.18	.07	**.74**	.10
The level of cooperation among competitors in our industry is very low. [R] ★				
Market Turbulence				
Demand and consumer tastes are difficult to predict.	.07	-.15	.14	**.58**
Customer's product preferences are changing rapidly.	.13	.21	.03	**.54**
Our company must rarely change its marketing practices to keep up with new or existing customers. [R]	-.20	.17	-.13	**.46**
New Customers tend to have product-related needs that are different from those of our existing customers. ★				
Customers' product preferences have become far more predictable in the last 2 years. [R] ★				
We are witnessing demand for our products and services from customers who have never bought them before. ★				

[R] Denotes reverse-coded item.

★ These items were dropped because they either had low loadings or loaded on more than one factor.

Notes: Loadings greater than .40 are in boldface for visual emphasis.
4-Factor solution accounted for 50.31% of the variance.

TABLE A4
Four-Factor Solution with Varimax Rotation for Strategic Orientation Items

	F1	F2	F3	F4
Customer Orientation				
We pay close attention to after-sales service.	**.53**	.12	-.02	-.05
We respond rapidly to competitor actions.	**.61**	-.03	.15	.06
We frequently measure customer satisfaction.	**.55**	-.02	.19	.18
We strive to maintain a high level of commitment in serving customers' needs.	**.72**	.05	-.06	.07
Our competitive advantage is based on thoroughly understanding customer needs.	**.70**	.01	.09	.21
Business strategies are driven by the goal of increasing customer value.	**.56**	.04	.11	.38
Our business objectives are driven by customer value.	**.76**	.13	.06	.14
Collaborative Orientation				
Collaborating with other firms provides a mechanism for developing mutually advantageous benefits.	.08	**.74**	.08	.06
Competitors can be used to enhance a firm's capabilities.	.03	**.50**	-.04	.16
By working together, firms in our industry can make the industry more profitable for everyone involved.	.08	**.70**	.09	-.18
Cooperating with other firms provides a mechanism for improving a firm's capabilities.	.14	**.84**	.03	-.06
With so many firms now collaborating, it seems like the right thing for firms to do. [R]	.07	**.70**	.10	.02
Collaborative activities should only be used for short-term gain. [R]★				
Other firms in our industry are important sources of information and resources for our firm. ★				
Firms that collaborate expose themselves to risk. [R]★				
Technological Orientation 1 [a]				
Our firm rapidly integrates new technologies into our product/service offerings.	.22	.09	**.52**	.27
Our new products/services always incorporate state-of-the-art technology.	-.08	.06	**.90**	.04
Our firm uses sophisticated technologies in its new product/service development.	.15	.14	**.86**	.18
Technological Orientation 2 [a]				
Our firm is very seldom the first business to introduce new products/services. [R]	.31	-.17	.04	**.54**
Our firm proactively develops new operating and product technologies.	.02	.15	.35	**.72**
In our firm, we take a proactive stance in generating new product/service ideas.	.34	-.04	.28	**.61**

[a] Following Gatignon and Xuereb's (1997) procedure, these two technological orientations were combined to form an overall measure of Technological Orientation. Cronbach's Alpha is shown in Table A6.
[R] Denotes reverse-coded item.
★ These items were dropped because they either had low loadings or loaded on more than one factor.
Notes: Loadings greater than .40 are in boldface for visual emphasis.
4-Factor solution accounted for 51.11% of the variance.